Bay Area Air Quality Management District
939 Ellis Street
San Francisco, CA 94109

Proposed
Regulation 12, Rule 11:
Flare Monitoring at Petroleum Refineries

Staff Report

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EXECUTIVE SUMMARY

Proposed District Regulation 12, Rule 11: Flare Monitoring at Petroleum Refineries is intended to implement control measure SS-15 from the Bay Area 2001 Ozone Attainment Plan. This new rule would require refineries to monitor the volume and composition of gases burned in refinery flares, to calculate flare emissions based on this data, to determine the reasons for flaring, to report all of this information to the District, and to provide video monitoring of flares. The rule will lead to much more accurate estimates of flare emissions, will allow the District to refine its emission inventory for flaring, and will provide information that is likely to lead to reductions in flaring.

Flares are primarily intended as safety and pollution control devices. They burn gases that cannot be used by the refinery and prevent their direct release to the atmosphere. The proposed rule would require the monitoring of these gases. The primary parameters to be monitored are vent gas flow to the flare and vent gas composition.

For monitoring of the volume of gas directed to flares, the rule establishes range and accuracy requirements that, at present, can be met only by ultrasonic flow monitors. These monitors are called time-of-flight (TOF) ultrasonic monitors. They determine flow velocity by measuring the time required for ultrasonic waves to travel in the flare gas from an "upstream" probe to a "downstream" probe and by comparing the time to that required for the slower "upstream" trip. This technology is the best available technology for measuring gas flow for flares. Two of the Bay Area refineries already have older ultrasonic monitors, but the rule would require all of the refineries to install newer, more sophisticated, and more accurate monitors.

For monitoring of flare gas composition, the rule allows two primary options: (1) collection of samples for subsequent lab analysis, or (2) use of continuous analyzers that sample gas and analyze it automatically. For the first option, samples can be collected with an auto-sampler or manually. Manual sampling is expected to be limited to infrequently used flares. For the second option, a number of continuous analyzer technologies are available: flame ionization detectors (FID), non-dispersive infrared (NDIR) spectrophotometry, and gas chromatography (GC). These methods are widely used by industry and by regulators, but have never been used on flare headers. The rule establishes appropriate methods and procedures for each technology.

The rule allows the two options, sampling and continuous analyzers, because each has advantages and disadvantages that may dictate one over the other for the specific flare in question. Sampling is a proven approach that will, over time, build a large set of data for each flare for which it is used. Continuous analyzers, though desirable because of the continuous data they can provide, have not yet been used to monitor flare vent gas, which is not as "clean" as most gas streams for which these analyzers are used. Use of continuous analyzers will require sample conditioning equipment that may be difficult to design and may require considerable maintenance. The rule represents a compromise, allowing a method that is known to work (sampling) while encouraging a method that the District would like to see proven in practice (continuous analyzers). This ensures that the rule will work and avoids the risk of rule failure that would come from mandating only continuous analyzers and the missed opportunity that

might come from mandating only sampling. District staff expects that the result may be the use of continuous analyzers on some flares and sampling on others.

The proposed rule requires monitoring data to be submitted to the District in a monthly report that is due within 30 days after the end of each month. The report must include flow data, composition data, emissions estimates, descriptions of all flaring activity, and information on any downtime for the monitors, and the archive of video images recorded for the month. The rule also requires a semi-annual report comparing flow monitor data for a period of time with a set of data for the same period derived by other methods. The comparison data can come from methods approved by the monitor manufacturer, from flow volume or velocity measurements using tracer gases, from flow measurements with pitot tubes, or from data derived from other methods approved by the District.

The proposed rule also requires video monitoring of flares. The flare image is required to be recorded, and the recorded images for each month must be submitted with the monthly report. This will allow the District to examine flare imagery to help explain any flaring, to respond to any community concerns or complaints, and to ensure that monitor data corresponds with the images.

The rule requirements would be imposed in steps that are based upon the District's determination about the length of time required to install the necessary equipment. All refineries would have to start taking daily composition samples within 3 months (some are already doing so). Within 6 months, each refinery will have to have continuous flow monitors in place. In 9 months, each refinery will be required to monitor composition at more frequent intervals using sampling or continuous analyzers.

The proposed rule would apply to the 25 flares located at the five Bay Area refineries: ChevronTexaco in Richmond (9 flares), ConocoPhillips in Rodeo (2 flares), Valero in Benicia (3 flares), Tesoro in Avon (6 flares), and Shell in Martinez (5 flares). Two of the twenty-five are not in service. All of the flares in service are currently monitored for some parameter, typically flow or vent gas heating value. The proposed rule would require that all of the refineries upgrade their current monitoring equipment, but the new equipment necessary and the costs involved would vary greatly, depending upon the sophistication of the currently-installed equipment. The District has estimated a range of costs for a refinery based on costs for the various options allowed under the proposed rule. The cost of the monitoring equipment for a single flare is roughly $200,000. The District has estimated the annual cost per flare, with equipment costs amortized over ten years and including operating and maintenance costs, to be $50,000 per flare per year.

In developing this rule, the District relied on information and data gathered during the District's flare further study effort. In August 2002, District staff held a workshop in Martinez to discuss basic rule concepts. It began developing a draft rule in late 2002, and in March shared preliminary drafts with representatives from the five Bay Area refineries, the Western States Petroleum Association (WSPA), and Communities for a Better Environment (CBE). In late March and early April, District staff held three community meetings to discuss detailed rule

concepts. The meetings were held in Richmond, Martinez, and Rodeo. Rule drafts were also shared with ARB and EPA.

After the proposed rule was developed for the May 21st Board hearing, the District convened the flare workgroup that has been working on the District's flare further study (further study measure FS-8 from the Bay Area 2001 Ozone Attainment Plan) to discuss the proposed rule. Additional issues were identified, and a revised rule is now proposed for adoption by the Board. To avoid confusion, this staff report refers to the rule prepared and made available with the public notice for the May 21st hearing as the "proposed rule." This is in keeping with standard terminology used by ARB, air districts, and the Health and Safety Code (§§40725, 40726). The revised version of the rule now proposed for adoption is called the "revised rule." Earlier drafts of the rule are called "earlier drafts."

At the May 21st Board hearing, a number of additional changes in the revised rule were suggested in comments by WSPA, individual refineries, the Air Resources Board, CBE, and refinery labor unions. In response to those comments, additional changes have been made to the revised rule. These changes are reflected in double underline / double strikethrough format in the revised rule. The revisions are in Sections 12-11-401, 502, 506, and 507. Brief discussions of the changed rule sections have been added to this staff report and are underlined. These changes are not so substantial as to change the meaning of the rule and can be adopted at the June 4, 2003 hearing. The most significant issue raised at the hearing was the issue of "webcasting." Staff is proposing that the webcasting issue be referred to the Stationary Source Committee of the Board because of its difficulty, because it was not included in the rule for which the CEQA document was prepared, and because resolution of webcasting issues could delay the rest of the rule substantially if not treated separately.

Pursuant to the California Environmental Quality Act (CEQA), the District prepared an initial study to determine the potential environmental impacts of proposed Regulation 12, Rule 11. The study identified the construction work required to install monitors as a source of potential environmental impacts. However, because of the safety requirements that govern this type of work, the regularity with which similar hot work is conducted in refineries, and the consequent familiarity with and preparedness for this type of work on the part of refinery workers and contractors, the study concluded that the proposed rule would not result in any significant environmental impacts. The document was circulated for comment, and no comments were received.

BACKGROUND

Flares provide a safety and emission control mechanism for refinery blowdown systems. Blowdown systems collect and separate both liquid and gaseous discharges from various refinery process units and equipment. The systems generally recover liquids and send gases to the fuel gas system for use in refinery combustion. However, when the heating value of the gas stream is insufficient, when the stream is intermittent, or when the stream exceeds what is necessary to satisfy refinery combustion needs, flares combust these gases and prevent their direct release to the atmosphere. Flares are designed to handle large fluctuations in the flow rate and hydrocarbon content of gases.

Flares and Similar Devices

A number of different devices may be called flares. A flare, as defined in the proposed rule, is a combustion device that uses an open flame to burn combustible gases with combustion air provided by uncontrolled ambient air surrounding the flame. The term is most commonly applied to the open air flare. It is also commonly applied to ground flares, which are located at ground level and typically have an enclosure around the open flame. The term "enclosed flare" may also be applied to this type of flare, regardless whether it is located at ground level. Flares, whether "open air," "ground," or "enclosed," rely on surrounding air for combustion and do not have any mechanism for control of this combustion air.

The term "thermal oxidizer" is sometimes used as a broad term to apply to many types of devices that oxidize combustible gases, including flares. However, the term is more properly applied to enclosed devices that, unlike flares, control the mixing of combustion air and fuel. As defined in the proposed rule, a thermal oxidizer is an enclosed or partially enclosed combustion device that is used to oxidize combustible gases, that generally comes with controls for combustion temperature and often with controls for air/fuel mixture, and that exhausts all combustion products through a vent, duct, or stack so that emissions can be measured directly.

In general, flares are used to control units and operations from which gas flows may be intermittent and may range from very low flows to very high flows. They are accepted as the most reliable way to ensure that the potentially enormous flows that may result from an upset or shutdown of a large refinery unit, a large block of units, or an entire refinery can be controlled.

Thermal oxidizers are generally used to control emissions from sources or operations for which flows are lower and more stable. These sources include wastewater systems, loading racks, storage vessels, pumps or compressors, and some relief systems on small process units. Because of the greater control over combustion afforded by temperature and mixture controls, thermal oxidizers typically have very high combustion efficiency. Thermal oxidizers are typically subject to permit conditions requiring combustion efficiency of 98% or higher. Because combustion products past through a vent, a duct, or a stack, the combustion efficiency of thermal oxidizers can be verified by source tests.

Flare Design and Operation

The open air flare is the predominant design type in the Bay Area. These flares are designed to handle large fluctuations in the flow rate and hydrocarbon content of gases. They are used to prevent releases of uncombusted materials generated during maintenance activities, emergency events such as power and equipment failures, and to a lesser extent as a control device for materials that cannot be recovered.

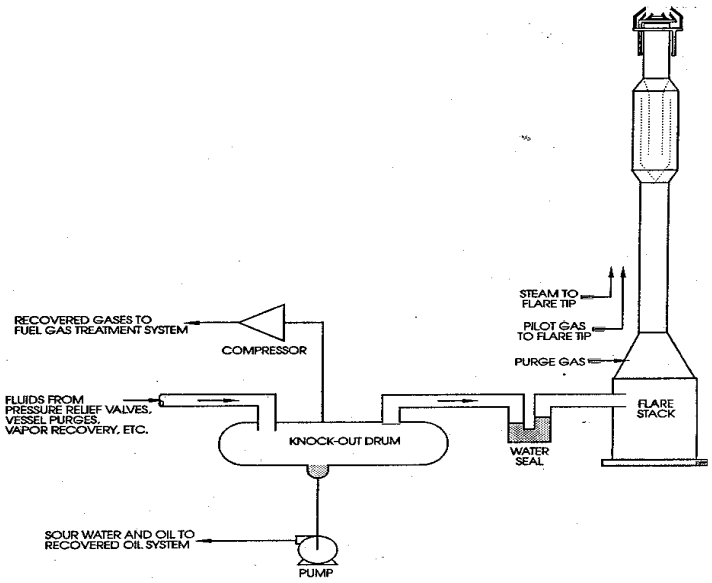

Figure 1. Typical Flare System

The diagram above illustrates a typical general service flare system. The system is a component of the refinery blowdown system. The blowdown system is designed to collect gases and liquids released throughout the refinery and direct them to the refinery recovery system or, when there is insufficient capacity to recover them, to a flare. These gases and liquids may be released for many different reasons. They may be normal byproducts of a process unit or vessel, they may result from an upset in a process unit, or they may come from refinery process units during startup and shutdown when the balance between gas generation and the combustion of that gas for process heat is disrupted.

The blowdown system delivers gases and liquids to a knockout drum that captures liquids and directs them to the oil recovery stream. The refinery flare gas compressors then direct gases to the fuel gas system. The extent to which these gases can be captured depends upon the capacity of the compressors. A refinery in good balance should be able to capture most of the gases delivered to the blowdown system during normal operations and use them to heat process units. This is not the case if a refinery has insufficient compressor capacity or when there is an upset or accident, and the volume of gases is too great for the compressors to handle.

Emissions from Flares

Flares produce air pollutants through two primary mechanisms. The first mechanism is incomplete combustion. Like all combustion devices, flares do not combust all of the fuel directed to them. Combustion efficiency is the extent to which the oxidation reactions that occur in combustion are complete reactions converting the gases entering the flare into fully oxidized combustion products. Combustion efficiency may be stated in terms of the extent to which all gases entering the flare are combusted, typically called "overall combustion efficiency" or simply "combustion efficiency", or it may be stated as the efficiency of combustion for some constituent of the flare gas as, for example, "hydrocarbon destruction efficiency."

The second mechanism of pollutant generation is through the oxidation of flare gases to form other pollutants. As an example, the gases that are burned in flares typically contain sulfur in varying amounts. Combustion oxidizes these sulfur compounds to form sulfur dioxide, a pollutant. In addition, combustion also produces relatively minor amounts of nitrogen oxides through oxidation of the nitrogen in flare gas or atmospheric nitrogen in combustion air.

Unlike internal combustion devices like engines and turbines, flares combust fuel in the open air, and combustion products are not contained and emitted through a stack, a duct, or an exhaust pipe. As a result, emission measurement is difficult.

Studies can be conducted on small flares under a hood or in a wind tunnel where all combustion products can be captured. Any results for these small flares must be adjusted with scaling factors if they are to be applied to full-size flares. For full-size operating industrial flares, which may have a diameter of four feet or more and a stack height of 200 feet or more, all combustion products cannot be captured and measured. To study emissions from these flares, emissions can be sampled with downwind test probes attached to the stack, a tower, or a crane. Emissions can also be studied using remote sensing technologies like open-path Fourier transform infrared technology (FTIR) or differential absorption lidar (DIAL). In applying the results of any particular study to a specific flare or flare type, it is important to note any differences in flare design and construction. For example, some flares are simply open pipes, while others, like most refinery flares, have flare tips that are engineered to promote mixing. In addition, studies suggest that composition and BTU content of gas burned, gas flow rates, flare operating conditions, and environmental factors like wind speed may affect, to varying extents, the efficiency of flare combustion.

The question of flare combustion efficiency is one of the issues being explored by the Technical Committee of the BAAQMD Advisory Council. On April 1, 2003, District staff and representatives from Bay Area refineries made presentations to the Committee on various flare issues, including combustion efficiency. The Committee has indicated that it intends to examine the efficiency issue and may invite experts to appear before it.

Bay Area Flares and Existing Monitoring Equipment

There are 25 flares at the five Bay Area refineries. Two of these flares are not in operation. All of these flares in service have some existing monitoring equipment to monitor one or more of the following parameters: (1) hydrogen sulfide content of the fuel gas used for the pilot, (2) status of the pilot light, (3) flame appearance to insure a smokeless operation, (4) heating value of the gases, (5) compliance with limits on the amount of material processed at the flare, (6) quantity of fuel gas, and (7) total reduced sulfur content. Table 2 on the following page lists flares that would be subject to the proposed rule. For each flare, the table lists the existing monitoring equipment and the reason or reasons that the equipment is installed.

Table 1: Existing Flare Monitoring

Site & Source #	Service	Parameter Monitored	Monitor Type	Basis[1]
Chevron				
6006	LSFO Low Level Flare		N/A	Disconnected
6010	LSFO High Level Flare	Pilot & purge gas, btu & HHV	Flow transmitter & chart	PC
6012	South Isomax	Pilot gas, btu & HHV	Rotameter	PC
6013	North Isomax	Purge gas, btu & HHV	Field meter	PC
6015	D&R Flare	Pilot & purge gas, btu & HHV	Flow transmitter & chart	PC, NSPS
6016	FCC Flare	Pilot & purge gas, btu & HHV	Flow transmitter & chart	PC
6017	SRU Flare	Pilot & purge gas, btu & HHV	Flow transmitter & chart	PC
6019	Alky Flare	Pilot & purge gas, btu & HHV	Flow transmitter & chart	PC
6039	Lube Flare (RLOP)	Pilot & purge, btu & HHV	Rotameter	PC
Shell				
1471	LOP Auxiliary Flare	Flow, molecular wt.	Ultrasonic	PC
1472	LOP Main Flare	Flow, molecular wt.	N/A	Blinded Off
1771	FXG Flare	H_2S, flow	Venturi	PC, NSPS
1772	HC Flare	H_2S, flow	Orifice	PC, NSPS
4201	Delayed Coking Flare	Molecular wt., sulfur, btu/scf, fuel flow		PC, NSPS
ConocoPhillips				
297	C-1 Flare	Flow	Ultrasonic, anemometer	PC, NSPS
398	C-602 Flare	Flow	Ultrasonic	PC, NSPS
Tesoro				
854	East Air Flare	Flow, sulfur	Ultrasonic	PC, NSPS
944	North Coker Flare	Flow, sulfur	Ultrasonic	PC, NSPS
945	South Coker Flare	Flow, sulfur	Ultrasonic	PC, NSPS
992	Emergency Flare	Flow, sulfur	Ultrasonic	PC, NSPS
1012	West Air Flare	Flow, sulfur	Ultrasonic	PC, NSPS
1013	Ammonia Flare	Flow		

Site & Source #	Service	Parameter Monitored	Monitor Type	Basis[1]
Valero				
16	Acid Gas Flare	Purge flow	Orifice plate	PC
18	South Flare	Oil, flow, hydrocarbon	Venturi meter, anemometer	EB
19	North Flare	Oil, flow, hydrocarbon, H_2S	Venturi meter, anemometer	EB, NSPS

[1] PC - Permit Condition
EB - Energy Balance
NSPS - Federal New Source Performance Standards for flares used as a control device

As shown in the table, a variety of technologies are used to quantify the volume of gases combusted. Each technology has advantages and limitations. Some of these have been identified by EPA in their Compliance Assurance Monitoring (CAM) Technical Guidance Document and are summarized in Table 3 on the following pages.

Table 2: Comparison of Flow Measurement Devices

Type of Flow Meter	Type of Measurement	Liquid, Gas, or Both	Applicable Pipe Diameter	Applicable Flow Rate	Straight Pipe Requirements[a]	Net Pressure Loss	Accuracy	Restrictions
Venturi Tube	Volumetric	Both	5 to 120 cm (2 to 48 in.)	Limited to ~ 4:1 flow range	6 to 20 D up 2 to 40 D down	10 to 20% of ΔP depending on β	± 0.75% flow rate w/o calibration	Eliminate swirl and pulsations
Flow nozzle	Volumetric	Both	7.6 to 60 cm (3 to 24 in.)	Limited to ~ 4:1 flow range	6 to 20 D up 2 to 4 D down	30 to 8.5% of ΔP depending on β	± 1.0% flow rate w/o calibration	Eliminate swirl and pulsations
Orifice plate	Volumetric	Both	1.3 to 180 cm (1/2 to 72 in.)	Limited to ~ 4:1 flow range	6 to 20 D up 2 to 4 D down	Slightly more than flow nozzle	± 0.6% flow rate w/o calibration	Eliminate swirl and pulsations
Magnetic	Velocity	Liquid (not petroleum)	0.25 to 250 cm (0.1 to 96 in.)	0.0008 to 9,500 L/min (0.002 to 2,500 gal/min)	None	None	± 1% flow rate	Conductive liquid, not for gas
Nutating disk	Volumetric	Liquid	1.3 to 5 cm (1/2 to 2 in.)	7.5 to 600 L/min (2 to 160 gal/min)	None		± 0.5% flow rate	Household water meter, low maximum flow rate
Oscillating piston	Volumetric	Liquid	1.3 to 5 cm (1/2 to 2 in.)	2.8 to 600 L/min (0.75 to 160 gal/min) Maximum of 4.3 to 480 m^3/hr (150 to 17,000 ft ^{3}/hr)	None		± 0.5% flow rate	Household water meter, low maximum flow rate
Bellows gas	Volumetric	Gas		Maximum of 4.3 top 480 m^3/hr (150 to 17,000 ft^3/hr)	None			Used for commercial and domestic gas service
Lobed impeller	Volumetric	Both	3.8 to 60 cm (1-1/2 to 24 in.)	30 to 68,000 L/min (8 to 18,000 gal/min)	None	Low	± 0.2% flow rate	Best used at high flow rates
Slide-vane rotary	Volumetric	Liquid	Up to 40 cm (Up to 16 in.)		None		± 0.1% to 0.2% flow rate	
Retracting-vane rotary	Volumetric	Liquid	Up to 10 cm (Up to 4 in.)		None		± 0.1% to 0.2% flow rate	
Helical Gear	Volumetric	Liquid	3.8 to 25 cm (1-1/2 to 10 in.)	19 to 15000 L/min (5 to 4,000 gal/min)	None	Low	± 0.1% to 0.2% flow rate	High viscous liquids only
Turbine	Volumetric	Both	0.64 to 60 cm (1/4 to 24 in.)	190,000 L/min (50,000 gal/min) 65 scmm (230,000 scfm)	10 D up 5 D down	34 to 41 kPa @ 6.1 m/sec. (5 to 6 psi @ 20 ft/sec) water flow	± 0.5% flow rate	Straightening vanes. Do not exceed maximum flow
Vortex Shedding	Velocity	Both	2.5 to 30 cm (1 to 12 in.)	0.30 to 6.1 m/sec (1 to 30 ft/sec) 11 to 19,000 L/min (3 to 5,000 gal/min)	10 to 20D up 5 D down	34 to 41 kPa @ 6.1 m/sec (5 to 6 psi @ 20 ft/sec) water flow	± 1% flow rate (liquid) ± 2% flow rate (gas)	Straightening vanes
Vortex Precession	Velocity	Gas	2.5 to 20 cm (1 to 8 in.)	0.30 to 6.1 m/sec (1 to 20 ft/sec)	10 to 20 D up 5 D down	5% more than shedder	± 2% flow rate	Straightening vanes
Fluidic oscillating	Velocity	Liquid	2.5 to 10 cm (1 to 4 in.)	Up to 6.1 m/sec (20 ft/sec)	6 D up 2 D down	34 to 41 kPa @ 6.1 m/sec. 5 to 6 psi @ 20 ft/s water flow	± 1.25 to 2% flow rate	Carefully determine minimum flow rate
TOF ultrasonic	Velocity	Both	> 0.32 cm > 1/8 in.)	Minimum 0.03 m/sec (0.1 ft/sec)	10 to 30 D up 5 to 10 D down	None	± 0.5% to 10% full scale	Need clean fluid

Type of Flow Meter	Type of Measurement	Liquid, Gas, or Both	Applicable Pipe Diameter	Applicable Flow Rate	Straight Pipe Requirements[a]	Net Pressure Loss	Accuracy	Restrictions
Doppler Ultrasonic	Velocity	Liquid	> 0.32 cm (> 1/8 in.)	Minimum 0.15 m/s (0.5 ft/sec); 0.38 L/min (0.1 gal/min)	Yes	None	As low as 1% flow rate	Fluid must have sufficient particles or bubbles
Thermo-anemometer	Velocity (mass)	Gas	> 5 cm (> 2 in.)		8 to 10 D up 3 D down	Very low	± 2% flow rate	Critically positioned probes Highly fluid composition dependent
Colorimetric	Velocity (mass)	Gas	> 5 cm (> 2 in.)		8 to 10 D up 3 D down	Low	± 4% flow rate	
Coriolis mass	Mass flow	Both limited gas	0.16 to 15 cm (1/16 to 6 in.)	Definitive max. + min. flow rate	None	High	± 0.2% to 0.4% flow rate	Pressure drop across flow meter cannot exceed max. system pressure drop
Rotameter	Velocity	Both	1.3 to 10 cm (1/2 to 4 in.)	Up to 750 L/min (200 gal/min for liquid); unlimited for gas	None	Low	± 1 to 2% full scale	Must be mounted vertically

Flow Monitoring Technologies

The following discussions of flow monitoring technologies are taken from EPA's CAM Guidance. Discussion is limited to those technologies most common in the Bay Area refineries.

Orifice Plates and Venturis

Orifice plates can be used to measure fluid flow in pipes with diameters of approximately 1.3 to 180 cm (0.5 to 72 in.). Orifice plates operate on Bernoulli's principle, which says that pressure decreases with increased flow velocity. An orifice plate consists of a square-edged or sharp-edged, thin opening in a metallic plate perpendicular to the flow. The opening is of a predetermined size and shape and is machined to tight tolerances. The flow velocity must increase through the orifice. The result is a higher pressure upstream of the plate and a lower pressure downstream. The pressure differential increases with flow velocity. The pressure readings for an orifice plate are obtained from a pair of pressure taps, one on either side of the plate:

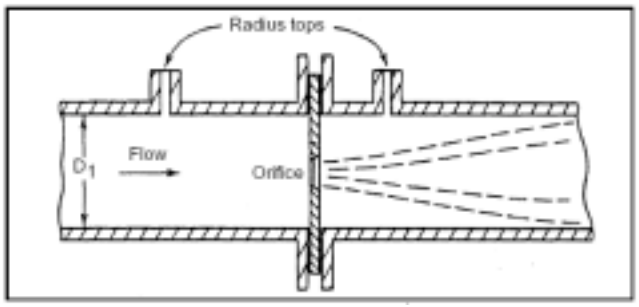

Figure 2. Orifice Plate

Venturi meters operate on the same principle. The pressure differential for a venturi is obtained from two taps: one at the full pipe diameter and one at the throat of the venturi.

Hot Wire Anemometer

The hot wire anemometer (figure 3) works by measuring the current drawn through the hot wire as a result of the cooling effect of the air flow extracting heat from the wire. The instrument maintains the wire at a fixed temperature so that as it is cooled by the air flow the current increases to maintain the temperature of the wire. The core of the anemometer is an exposed hot wire either heated up by a constant current or maintained at a constant temperature (figure 4). In either case, the heat lost to fluid convection is a function of the fluid velocity.

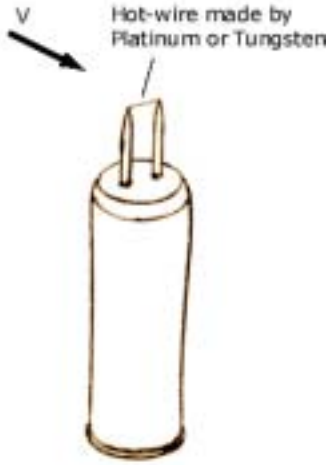

Figure 3. Typical Hot-Wire Anemometer

By measuring the change in wire temperature under constant current or the current required to maintain a constant wire temperature, the heat lost can be obtained. The heat lost can then be converted into a fluid velocity in accordance with convective theory.

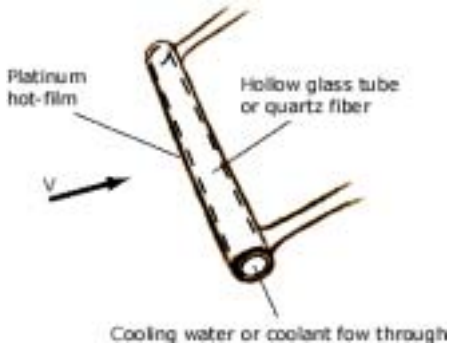

Figure 4. Anemometer Hot Wire

Ultrasonic Flow Meters

Two types of ultrasonic flow meters are available: time-of-flight (TOF) and Doppler. Doppler meters are suitable only for liquids and are not discussed here. In TOF ultrasonic flow meters, sound waves are introduced into the flowing fluid, one wave traveling with the flow and one wave traveling against the flow. The difference in transit time of the waves is proportional to the fluid flow rate, because the sound wave is accelerated when traveling with the flow and slowed when traveling against the flow. If the sound wave velocity of the fluid (speed of sound) is known, the transit distance is known, and time difference is known, then the fluid flow rate can be determined. Time-of-flight ultrasonic flow meters can be classified as one of the following: axial transmission, multi-beam (transverse or longitudinal) contra-propagating, cross beam, sing around, and reflected beam. Figure 5 depicts a TOF ultrasonic flow meter.

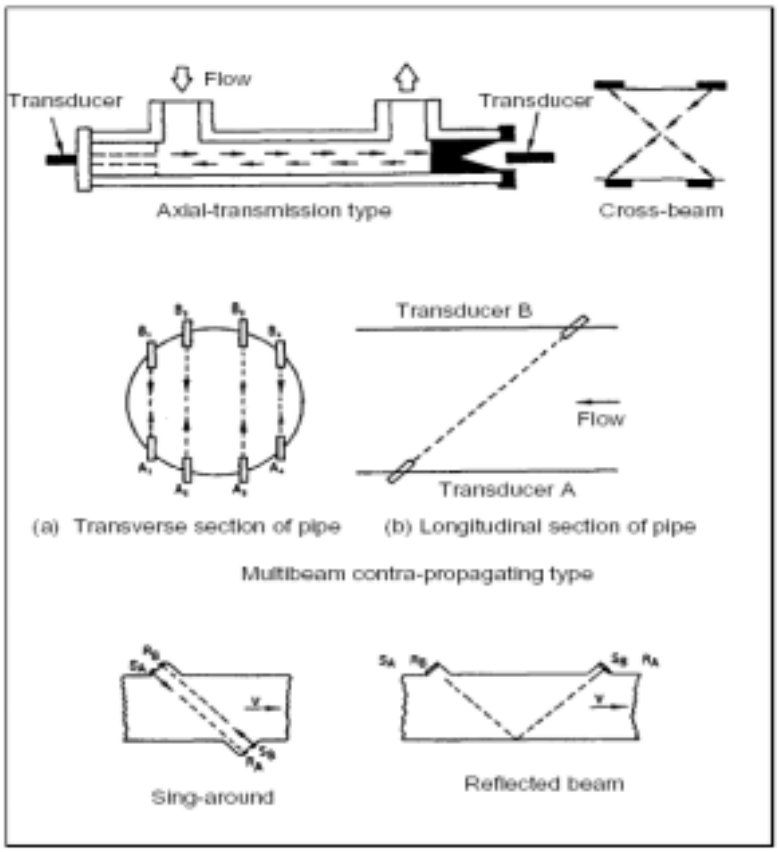

Figure 5. Time of flight ultrasonic flow meter

Ultrasonic flow meters are comprised of the following basic parts: the transducer, receiver, timer, and temperature sensor. Ultrasonic flow meters can be used to measure fluid flow in pipes with a diameter greater than 0.32 cm (0.125 in.) with a minimum flow rate of approximately 0.38 L/min (0.1 gal/min). Time-of-flight ultrasonic flow meters are applicable to liquids and gases flowing at velocities greater than 0.03 m/sec (0.1 ft/sec).

Gas Composition Monitoring

The type of composition monitoring currently in use at a refinery depends upon the applicable regulatory requirements, as shown in Table 2. Regulatory requirements are specified in the District imposed permit conditions or in Federal requirements. The most common requirement is that a flare be monitored for emissions of sulfur oxides to meet New Source Performance Standards for flares used as a control device. For some flares, the District has imposed conditions on flares for purposes of controlling odors or to meet offset requirements. Typically these conditions place limits on the quantity and composition of fuel gas that can be burned, impose design criteria for tip velocity, and specify analytical protocols. Some composition monitoring may be done to meet other needs of the facility. For example, some facilities analyze for composition to "energy balance" the consumption of fuel gas within individual process units. All of the composition monitoring being done at the Bay Area refineries at present is through sampling and subsequent lab analysis.

Composition can also be monitored by continuous analyzers. Several technologies are available: the flame ionization detector (FID), the non-dispersive infrared (NDIR) spectrophotometer, and gas chromatography (GC).

A flame ionization detector (FID) burns sampled gas in a hydrogen flame. Organic compounds produce positive ions, which are collected at an electrode above the flame. The generated current is then measured. The FID is useful for measuring concentrations of organic compounds and is very sensitive and accurate over many orders of magnitude. Because the FID responds to any molecule with a carbon-hydrogen bond, but not at all, or poorly to other compounds, it is not useful for measuring concentrations of hydrogen sulfide or sulfur dioxide.

A non-dispersive infrared (NDIR) spectrophotometer measures the amount of infrared radiation that is absorbed by a sample. Infrared radiation from a hot wire is directed through two parallel cells: a reference cell filled with nitrogen, and a cell through which the sample flows. The gas in the sample cell absorbs an amount of energy proportional to its concentration. This is converted into an electrical output by the detector. The NDIR is commonly used to measure carbon monoxide, carbon dioxide, methane, and total hydrocarbon concentrations.

A gas chromatograph, or GC, consists of a column, oven, and detector. The column separates the gas sample into its various components. GC columns are available in different sizes, and packing for the columns depends upon the composition of the gas stream to be analyzed. The oven provides a controlled temperature enclosure for the column. The detector has to be chosen based on the type of gases being analyzed. A thermal conductivity detector or a FID can be used as the detector on a gas chromatograph.

In the gas chromatograph, a sample goes to the column, separates into individual compounds and proceeds through the hydrogen flame ionization detector, generating a response called a chromatogram. The various chemical components contained within the sample travel through the column at different speeds, depending on their respective solubility in or adsorption on the packing material (liquid or solid). The height of the peak on the chromatogram is related to the

concentration and the time it takes to go through the column, which helps identify the component.

History of Monitoring

In 1984, Citizens for a Better Environment (CBE) petitioned the California Air Resources Board (CARB) to evaluate the feasibility of continuous emission monitors for refinery flares. CARB determined that no refinery in California accurately monitored flow rates to its flares. Several types of flow meters had been installed on refinery flares, but the instrumentation could only provide relative flow information because gas density varies and gas composition data is necessary to calculate flow accurately. CARB concluded that continuous monitoring of flow rates and composition and remote monitoring of flare plumes would require substantial development before it would be available. CARB determined that monitoring devices were available for limited applications to identify and record continuously the on/off status of flares. CARB also encouraged local air pollution control districts to adopt rules requiring refineries to install on/off status monitors and collect flare gas composition data so that a suggested control measure for the control of emissions from refinery flares could be developed.

In response to the CARB findings, the District conducted a flare monitoring study in 1988 and 1989 using the tools that were then available (BAAQMD 1990). Instantaneous flow information was obtained using pitot tubes. Composition was analyzed by taking grab samples at the same time that the flow measurement was made. All of the data simply gave the District a series of "snapshot" data. Conclusions had to be extrapolated from this limited data by assuming that it was representative of refinery operations, but there was no way to determine whether this was a valid assumption. Nevertheless, it remained the only flare flow and composition data set available for Bay Area refineries. The data collected was used as a basis for adjustments to the emission inventory used for the Bay Area 2001 Ozone Attainment Plan.

By the 1990's, ultrasonic flow meters were coming to be regarded as a reliable way to measure flare flows. Recognizing that the ultrasonic meters provided a reliable means of monitoring flare gas, the South Coast Air Quality Management District adopted its Rule 1118 requiring refinery flare monitoring. The rule was adopted in 1998, but there were numerous delays, and monitors were finally installed and operational by late 2000.

California Air District Regulations

The following table summarizes existing flare regulations within California.

Table 3: California Flare Monitoring Rules

Regulation	Control/Performance Requirements	Monitoring Requirements	Minimization Plan	Emission Limitations
SCAQMD Rule 1118	None	Gas flow, heating value and sulfur content	No	No
SJVAPCD Rule 4311	Open Air Flares <5psig must meet 40 CFR section 60.18	For flares used during an emergency, record of the duration of flare operation, amount of gas burned, and the nature of the emergency situation.	No	Ground level enclosed flares only
SBAPCD Rule 359	Heating value, exit velocity, automatic ignition system	Presence of a flame	Yes	Sulfur compounds may not exceed 15 grains per 100 cubic feet (239 ppmv) in the Southern Zone of Santa Barbara County or 50 grains per 100 cubic feet (796 ppmv) in the Northern Zone of Santa Barbara County; smokeless

In 1994, the Santa Barbara Air Pollution Control District (SBAPCD) adopted Rule 359, Flares and Thermal Oxidizers. This rule applies to flares and thermal oxidizers used in oil and gas production, petroleum refineries and related sources, natural gas supply and transportation sources, and in distribution petroleum/petroleum products. Rule 359 specifies sulfur content limits for flare gas, technology-based standards for flares and thermal oxidizers, emission limits for nitrogen oxides and reactive organic compounds, and operational limits. The rule also requires plans to minimize use of flares.

In 1998, the South Coast Air Quality Management District adopted Rule 1118 (Emissions from Refinery Flares), which requires refinery flare monitoring. Monitors were installed and operational by late 2000.

In 2002, the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) adopted Rule 4311, Flares. This rule requires all open air flares to comply with federal limitations on sulfur in fuel gas. The federal requirement (40 CFR section 60.18) is found in New Source Performance Standards and, in the absence of the SJVUAPCD rule, would apply only to new flares. The rule does not impose extensive monitoring requirements like those in the proposed District rule or in SCAQMD Rule 1118.

PROPOSED RULE

Proposed Regulation 12, Rule 11 would require refiners to:

- Continuously monitor vent gas flow for each flare;
- Monitor vent gas composition either by (1) taking samples manually or with an auto sampler, or by (2) using continuous analyzers;
- Submit monthly reports that include vent gas flow and composition, pilot and purge gas flow, estimates of hydrocarbon and sulfur emissions, descriptions of all flaring of more than 1 million standard cubic feet of vent gas (duration, time, cause, measures to reduce or eliminate), and monitor downtime;
- Monitor flare operation by video camera and record and retain recordings of flare images.

These requirements would be imposed in steps that are based upon the District's determination about the length of time required to install the necessary equipment:

- Effective in 90 days, each refinery would be required to begin daily sampling for composition when there is flaring activity. (Some refiners already have this capability and are reporting this data to the District pursuant to an agreement entered into pursuant to the flare further study effort described in the introduction; others will have to install necessary sampling ports.)

- Effective in 180 days, each refinery will have to have continuous flow monitors in place. This effective data is based upon the expectation that the manufacturer of ultrasonic flow monitors will be able to supply, and the refiners will be able to install, these monitors within this time.

- Effective in 270 days, each refinery will be required to have in place the equipment necessary to monitor composition at more frequent intervals or continuously. If sampling is chosen, the refineries will have to determine how to take more frequent samples, either through installation of auto-samplers or additional staffing, and how to process these samples, either in their own labs or through outside labs. If continuous analyzers are chosen, the refineries will have to design and install sample conditioning systems and analyzers, or arrange to have this work done by outside vendors.

The following sections of the staff report discuss the provisions of the proposed rule in the order in which they appear in the rule. In this discussion, the rule prepared and made available with the public notice for the May 21st hearing is called the “proposed rule.” This is in keeping with standard terminology used by ARB, air districts, and the Health and Safety Code (§§40725, 40726). The revised version of the rule now proposed for adoption is called the “revised rule.” Earlier drafts of the rule are called “earlier drafts.”

Exemptions

The exemptions are intended to make it clear that the rule applies to flares and not other types of abatement devices used to control small sources and operations such as storage tanks or loading racks. These sources are subject to other BAAQMD rules and permit conditions. In particular, the exemptions make it clear that the rule is not intended to apply to thermal oxidizers, which differ from flares in numerous respects but most importantly in having emissions that can be directly measured and verified by source tests. For a discussion of this issue, see the discussion of the definition section of the rule below.

Section 12-11-110 Exemption, Organic Liquid Storage and Distribution

This exemption would exempt flares or thermal oxidizers controlling emissions exclusively from storage tanks or loading racks. The exemption would apply to six sources in the District. The first is a backup safety flare that serves a vapor recovery system for a propane tank at the Tesoro refinery. This flare is designed to control emissions from the propane tank if the tank's vapor recovery system fails or is taken out of service for maintenance. The second is also a backup safety flare that serves a vapor recovery system for a butane tank at the Valero refinery. This flare serves the same purpose as the flare at Tesoro. The other four sources are located at the Shell refinery. Three of the flares are backup safety flares for three vapor recovery systems that serve fixed roof storage tanks. The other Shell flare serves a liquefied petroleum gas (LPG) railcar loading operation at the Shell refinery. Railcars are unloaded using natural gas to push the LPG (propane and butane) out of the railcar. When railcars arrive at the refinery for loading, propane and butane displace the natural gas to the flare. So this flare combusts natural gas and small amounts of LPG that vaporizes during the loading. For 2002, Shell loaded 971 tank cars. Total annual non-methane hydrocarbon emissions from the flare were approximately 1000 pounds. All of the flares exempted by this provision, with the exception of Shell's railcar loading flare, are backup safety flares and are not primary control devices. At 3 pounds per day, emissions from Shell's railcar loading flare are not significant.

Section 12-11-111 Exemption, Marine Vessel Loading Terminals

Marine vessel loading terminals are located at all five Bay Area petroleum refineries. All terminals are subject to Regulation 8, Rule 44, which requires that emissions from the loading of specified cargos by reduced by 95% or to 2 pounds per thousand barrels of cargo loaded. Thermal oxidizers are used at the Chevron, ConocoPhillips, and Shell refineries to meet the rule's control requirements. No terminal uses a flare for control. The thermal oxidizers at the three marine terminals have high efficiencies that are mandated by the rule and by permit conditions and can be directly verified by source tests. Because these devices are, by definition, thermal oxidizers, they are not subject to the rule. This exemption is therefore included merely to clarify that this is the case.

Section 12-11-112 Exemption, Wastewater Treatment Systems

The Valero and Tesoro refineries each use a thermal oxidizer to control components of the refinery wastewater treatment system. As discussed above, properly operated thermal oxidizers

have high control efficiencies that can be verified by source tests. Like all thermal oxidizers, these thermal oxidizers are, by definition, not subject to the rule, and the exemption is included to make this clear.

Section 12-11-113 Exemption, Pumps

Pumps are subject to the District's equipment leak rule, Regulation 8, Rule 18. The rule imposes the most stringent equipment leak limits in California, and one way of complying is by installing containment around a pump seal and directing emissions to an abatement device. Both the Chevron and Tesoro refineries use thermal oxidizers to control emissions from some pump seals. These thermal oxidizers are, by definition, exempt from the rule, and the exemption is intended to make this clear. If fugitive emissions from pumps are directed to the refinery's general blowdown and relief system, additional language makes it clear that the exemption would not apply to exempt a flare that might combust these emissions.

Section 12-11-114 Limited Exemption, Total Hydrocarbon and Methane Composition Monitoring and Reporting

This section does not appear in the proposed rule. Earlier drafts of the rule included a broader exemption from hydrocarbon reporting for flares that exclusively serve sulfur plants and ammonia plants or exclusively burn flexicoker gas. This broad exemption was dropped from the proposed rule.

Staff are now recommending a more limited exemption for flares that exclusively burn flexicoker gas with or without supplemental natural gas. Coking is a final refining stage that separates light products from the heavy coke byproducts of refining. The process converts feed with a very high carbon/hydrogen ratio into distillate products. Flexicoking is a continuous coking process that minimizes coke production and maximizes the production of useful products. It uses a gasifier in which steam and air are combined with the coke to produce gas. After hydrogen sulfide is removed from the gas, it is used as a fuel within the refinery. The process leaves very little coke.

Flexicoker gas has very consistent composition. Gas from the flexicoker at the Shell refinery is primarily nitrogen, carbon monoxide, hydrogen, and carbon dioxide. It typically has a methane content of less than 2%, a non-methane hydrocarbon content of much less than 1%, and very low sulfur content. A flare is used to burn flexicoker gas that cannot be used by the refinery. Under this exemption, Shell's flexicoker flare would be exempt from hydrocarbon monitoring requirements provided it meets the conditions in the exemption that limit methane content to less than 2% and non-methane hydrocarbon content to less than 1%. Monitoring for flow and sulfur composition would still be required.

Definitions

As with all District rules, the proposed flare monitoring rule defines key terms used in the rule. There are two things to note about the definitions. First, the terms "flare" and "thermal oxidizer"

are defined (Sections 12-11-201 and 209) to make it clear that the rule applies to the flares that are listed in this staff report and not to thermal oxidizers and other abatement devices. The distinction drawn between flares and thermal oxidizers is that the latter term describes an enclosed combustion device that exhausts all combustion products through a vent, duct, or stack so that emissions can be measured directly. The intent of this rule is to require monitoring of open-flame devices – flares – from which emissions cannot be measured in the conventional manner. For a flare, there is no stack or duct in which probes can be located and emissions measured. The rule therefore requires the monitoring of gases directed to flares. The rule is not intended to impose these same requirements on thermal oxidizers, from which emissions can be measured directly, and the definitions are intended to draw this distinction. Thermal oxidizers typically have VOC destruction efficiencies that range from 98 to 99.99% and above.

A second important aspect of the definitions is that the term "vent gas" is defined (Section 12-11-210) to include all gas directed to a flare, excluding steam or air used to aid combustion and excluding pilot and continuous purge gas. This definition is then used in the definition of "flaring" (Section 12-11-203). The result is that "flaring" is any time the flare has a flame other than the pilot flame. The term is used in the interim sampling provisions in Section 12-11-502.2 to ensure that samples are taken while active flaring is occurring.

Administrative Requirements

The Administrative Requirements set forth reporting requirements.

Section 12-11-401 Flare Data Reporting Requirements

In the proposed rule, this section requires a monthly report that must include the following:

- Upon rule adoption, total flow for each day and for the month. The Bay Area refineries currently have various means of determining flow and are reporting this data to the District pursuant to an agreement developed for flare further study measure FS-8. The rule will require continued reporting of this data. After the flow monitors required by Section 12-11-501 are installed, the report would also have to include flow for each hour of the month (ultrasonic flow monitors are capable of providing much greater flow detail than the means currently employed by most of the refineries).

- Methane, total hydrocarbon and sulfur content for every vent gas sample, and if continuous analyzers are used, for every hour of the month.

- If the flow monitor measures molecular weight (as ultrasonic monitors do), the average molecular weight of vent gas for each hour of the month.

- Type and quantity of pilot gas and purge gas used for each day and for the month. Where these flows are constant because of flare design, the parameters that dictate flow and the resultant flow are sufficient.

- For any 24-hour period during which more than 1 million standard cubic feet of vent gas are flared, a descriptions of the flaring, including time, duration, cause, the source of the vent gas, and any measures taken to reduce or eliminate flaring.

- Flare monitoring downtime.

- The archive of video images required by Section 12-11-507.

The revised rule adds a requirement for calculated emissions that was included in earlier drafts but dropped from the proposed rule. At the request of WSPA and the Unions at the May 8th flare workgroup meeting, the revised rule re-incorporates a requirement for emission calculations. The Unions suggested using the efficiencies specified in the Texas rule (98% for most flares, 93% for low-BTU gases). While WSPA has argued for higher efficiency, the revised rule includes the Unions' suggestion.

The reasoning behind specifying an efficiency figure, as articulated by the Unions and WSPA, seems to be that it is better to provide the public with some estimate of total emissions, even if the estimate employs some assumptions that are open to debate. District staff was persuaded by this reasoning, and so has incorporated assumed efficiencies in the proposed rule. However, it is important to note that these efficiencies are set for the narrow purpose of emissions estimates to be made in reports submitted by refineries pursuant to the rule. The revised rule does not restrict the District or anyone else from using a different efficiency figure in any other context. If the District does use a different efficiency figure, it will of course explain it's reasoning for doing so. If more reliable information regarding flare efficiency becomes available, the District will consider revising the rule to reflect that information.

The revised rule also adds language to this section to require the submission of additional composition data that is not required by the section but is available from sampling analyzers or continuous analyzers.

On May 21, 2003 following the initial hearing on the rule, the District convened a meeting of the flare workgroup to discuss issues raised at the hearing. The meeting was attended by representatives for WSPA, the individual refineries, refinery trade unions, and CBE. In response to concerns raised by the unions and CBE, a minor change to the revised rule is proposed in Section 12-11-401.9. The revised rule incorporated the concept of specifying an efficiency of 98% except for low-BTU flexicoker gas, for which 93% was the default value. Staff are now proposing a change that requires the use of 93% for any vent gas with a lower heating value less than 300 British Thermal Units/Standard Cubic Feet (BTU/SCF). This is a minor change because data gathered during the flare study shows that most flare gas, with the exception of flexicoker gas, exceeds this BTU threshold.

Section 12-11-402 Flow Verification Report

This section requires a semi-annual report on alternative means of determining flow to serve as a check on the data being provided by the flow monitors. Ultrasonic flow monitors provide the most accurate and reliable means available to determine flare header flow. No currently

available alternative method can provide similar precision or accuracy. If the ultrasonic monitor has been installed and calibrated properly and the data logger has been programmed properly, the data should be reliable. In one case during the flare study recently conducted by the District, a refinery submitted data from an ultrasonic monitor and mistakenly assumed that the ultrasonic monitor range setting was 10 times the actual set range (for example, a value was assumed to be 5 million when it was actually 500,000). The required semi-annual report will provide a means of detecting such errors through a comparison of other data to the reported data. There are several alternative ways of determining flow that can be used as a "reality check" on the monitor. These alternatives are listed in Section 12-11-602 (see the discussion of that section for an explanation of each alternative). If a semi-annual report suggests that there may be a problem with a monitor, the District will be able to investigate further to determine whether the monitor still meets the requirements of Section 12-11-501 (requiring the monitor to accurately measure flow rate).

No other flare monitoring rule includes a flow verification requirement. This is true of both the South Coast AQMD petroleum refinery flare and the Texas chemical plant flare rule. This is primarily because it is difficult to know whether differences between ultrasonic flow meter measurements and measurements through alternate means should be attributed to inaccuracy in the meter or in the alternate method. (For more information on this issue, see the discussion of Section 12-11-501.)

For these reasons, it is difficult to specify how close the meter measurement must be to the expected measurement as derived from the flow verification. In the revised rule (Section 12-11-501), staff is including language that would specify that the difference be no greater than ±20%.

Monitoring and Records

The Monitoring and Records requirements are central to the rule and impose the various monitoring and recordkeeping requirements.

Section 12-11-501 Vent Gas Flow Monitoring

This section requires continuous monitoring of vent gas flow. The proposed rule specifies that the device used to do this monitoring (1) must be capable of detecting a minimum flow velocity of 0.1 feet per second, (2) must continuously measure the range of flow rates corresponding to flow velocities from 0.5 to 275 feet per second, and (3) must be installed on the flare header in a location that ensures that the device measures all flow. Three additional requirements are recommended by staff and are included in the revised rule. These additional requirements would specify that the device (1) must have a manufacturer's specified accuracy of ±5% over the range from 1 to 275 feet per second, (2) must be maintained to be accurate to within ±20% as demonstrated by the flow verification report specified in Section 12-11-402 (effective 12 months after installation), and (3) must be accessible to the APCO to verify proper installation and operation.

Section 12-11-501.1 requires the use of a device having a limit of detection of 0.1 feet per second. The "limit of detection" of an instrument is the lowest value of a parameter being measured that an instrument can reliably distinguish from zero. The limit of detection in the rule comes from ultrasonic flow meter product literature, and the value is from laboratory testing. Product literature from two manufacturers of ultrasonic flow meters (Panametrics and Roxar) both specify minimum detectible velocities in this range.

The primary criterion for any device installed pursuant to this section is that it be able to measure flow velocities over the range from 0.5 to 275 feet per second (Section 12-11-501.2). This range is taken from product literature for ultrasonic flow meters and is the general range over which the manufacturers claim the meters to be accurate. The revised rule now includes the manufacturer's specified accuracy based on laboratory testing (Section 12-11-501.3 in the revised rule).

"Accuracy" is used in EPA and District regulations and in metrology, the science of measurement, to mean closeness to the truth. Although the ultimate true value of any parameter being measured cannot be known, accuracy is treated as the difference between a value measured by an instrument and an accepted true value or standard. These accepted values or standards are established by the National Institute of Science and Technology (NIST) or other nationally recognized measurement standards bodies. NIST was formerly the National Bureau of Standards and is responsible for developing, maintaining, and retaining custody of U.S. national standards of measurement. For example, a carton of milk is filled based on a NIST standard for measuring volume. Time throughout the U.S. is based on the official NIST time as maintained by NIST's atomic clock in Boulder, Colorado.

For fluid flow, there are no standard measurement artifacts like those for length or volume. Instead, NIST has established flow measurement standards based on devices that deliver a measured volume of fluid over a measured time interval, with these measurements referenced to established NIST standards for volume and time. NIST provides calibration services for gas flow meters, thus allowing testing laboratories to calibrate master flow instruments that can be used to verify the accuracy of meters for field use. Accuracy for ultrasonic flow meters therefore generally refers to the closeness to the NIST-established "truth" under laboratory conditions. Although many laboratories can test liquid flow meters, there only a few testing laboratories in the United States that can test ultrasonic gas flow meters against standards traceable to the NIST standards.

Though ultrasonic flow monitors can be calibrated at a flow laboratory prior to installation and can be determined to measure known flows accurately, unless the calibration facility can replicate the pipe size and likely conditions under which the meter will operate in a particular flare header, one simply can't say with certainty what the accuracy of field measurements will be. However, because these meters are extremely accurate under laboratory conditions, it is reasonable to assume that properly installed meters are accurate in the field. For any method used to check meter accuracy in the field, it is difficult to know whether differences between the meter measurement and the measurement derived using some alternate method should be attributed to inaccuracy in the meter or in the alternate method.

Staff recommend, and the revised rule includes in Section 12-11-501.6, an accuracy specification based on the flow verification required by Section 12-11-402. The revised rule states that effective 12 months after installation of the ultrasonic meters, the flow verification shall demonstrate a meter accuracy of ±20%. This will allow a year of experience with the meters and with various flow verification methods. District staff expect that through this experience it will become clear whether the accuracy requirement can be met. District staff is proposing to report back to the Board 18 months after rule adoption. If it appears that the specification should be changed, staff can recommend appropriate changes at that time.

Section 12-11-501.4 requires that the meter be installed at a location that ensures that the device measures all flow. An early draft of the rule specified that the meter must be installed at a location after the knockout pot, after all locations at which supplementary fuel is introduced, and after the water seal. This more prescriptive language was derived from a recently adopted Texas rule that applies to flares that combust certain highly-reactive VOCs. (Because refinery flare gas does not typically contain significant amounts of these highly-reactive VOCs, the Texas rule would not apply to most refinery flares and is instead intended to apply to chemical plants.)

District staff determined that using the prescriptive approach of the Texas flare rule in this context would have required the installation of meters within the radiation zone for some Bay Area flares. Less prescriptive language is proposed to allow discretion to locate a meter where it would still measure all significant flows while avoiding damage to the meter.

Section 12-11-501.5 specifies, effective 180 days after adoption of the rule, that the APCO is to have access to the flow monitoring system to verify proper installation and operation.

Section 12-11-502 Vent Gas Composition Monitoring

This section requires composition monitoring of vent gas. At present, some of the Bay Area refineries are taking daily samples of vent gas for lab analysis. Within 90 days after rule adoption and until more stringent requirements in the section take effect, all Bay Area refineries are required to take and analyze a grab sample for each day on which there is flaring activity (Section 12-11-502.2). These samples are required to be taken within 30 minutes after flaring begins.

Effective nine months after rule adoption, more stringent composition monitoring requirements take effect. Refiners will have two primary options: (1) sampling and subsequent lab analysis, or (2) the use of continuous analyzers. There are then alternatives with each of the primary options. The various options are discussed below.

Sampling

Sampling is proposed as an option because the technology is proven, is robust, and is already in widespread use. Sampling can be more economical because sampling equipment will not require sample conditioning trains as complex as those required for continuous analyzers. However, sample processing in a lab can be labor and time intensive, and, with a short sampling interval, can become as expensive as other options. Both manual sampling and auto-sampling are proven

in practice. A number of refineries in Southern California are using auto-samplers to take vent gas samples as required by the South Coast AQMD flare monitoring rule. With manual sampling, great care must be taken to ensure the safety of refinery workers involved in sampling. In some cases, the available sampling locations may have potential to expose workers to dangerous high temperatures if the vent gas flow rate is high.

The proposed rule allows only integrated sampling, which relies upon automated sampling equipment. Integrated sampling produces a composite sample out of individual aliquots taken over time. An aliquot is a fractional part of the sample that is an exact divisor of the whole sample. For example, ten aliquots of 100 milliliters each could compose a 1 liter sample. Because the aliquots are taken over time, the sample reflects variation in composition that may occur over time. Integrated sampling was included as the only sampling option in the proposed rule because of its potential to reflect composition variation with time.

District staff now recommend that two alternative sampling options be available: manual sampling and integrated sampling. The revised rule reflects this recommendation. The reason for including a manual sampling option is that a number of flares in the District are very rarely used: some less than once in a year and others less than once in several years. For these flares, a requirement to use integrated sampling or continuous analyzers would dictate the installation and maintenance of expensive and sensitive equipment that would rarely be used. This equipment would require regular attention to ensure that it remains in a state of readiness. As a result, Section 12-11-502.3.1 sets forth a manual sampling option.

This manual sampling option is probably not practical for flares that are used with some regularity. The need to continually take samples would be burdensome, and would likely result in missed samples. The likely outcome of the inclusion of this option is that its use will be restricted to these low usage flares.

On May 21, 2003 following the initial hearing on the rule, the District convened a meeting of the flare workgroup to discuss issues raised at the hearing. The meeting was attended by representatives for WSPA, the individual refineries, refinery trade unions, and CBE. In response to concerns raised by WSPA and individual refineries, a minor change to the revised rule is proposed in Section 12-11-502.3.1.a. The revised rule allowed up to one hour to take the first sample for a flare serving a sulfur plant. The reason for the proposal was that taking a sample at such a flare could expose workers to extremely dangerous concentrations of hydrogen sulfide. Safety procedures would require the use of extensive safety equipment including self-contained breathing gear. Because preparation for taking such a sample would require a significant amount of time, the allowance was one hour rather than 15 minutes to take the first sample. At the flare workgroup meeting, the refiners pointed out that the same risks applied at ammonia plant flares. Staff are now proposing a minor change that would extend the same allowance to these flares and also give refiners an additional option of submitting worst-case composition data in lieu of undertaking sampling that could be extremely hazardous under some circumstances. The data would have to be verified by the APCO as properly representing worst-case composition.

As noted, the only sampling option included in the proposed rule was integrated sampling. District staff are recommending retention of this option with modifications to the sampling

trigger and additional language to ensure that sample containers are not left in service for more than a day.

Sampling Trigger

Staff recommend adoption of the South AQMD trigger for sampling. The revised rule states that if the flow rate in any consecutive 15-minute period continuously exceeds 330 standard cubic feet per minute, sampling must begin within 15 minutes. Sampling must continue until flow rate in any consecutive 15-minute period is continuously 330 standard cubic feet per minute or less. The proposed rule set the sample trigger for integrated sampling at 6,000 standard cubic feet in a 15-minute period. An earlier version of the rule proposed 50,000 standard cubic feet in one hour as the trigger for sampling.

All efforts to set the sampling trigger have been based on setting the trigger at the lowest flow velocity at which (1) the flow meter is accurate and (2) the measured flow would represent real flow to the flare. The earlier draft's proposed trigger of 50,000 standard cubic feet in an hour was based on a flow velocity of 1 foot per second. In response to comments from community and labor groups, the triggers in both the proposed rule and the revised rule are based on a flow velocity of approximately 0.5 foot per second. The recommended trigger included in the revised rule is identical to the trigger in the South Coast AQMD flare monitoring rule.

The flow velocity for a given volumetric flow rate depends upon the size of the flare header. The table below lists volumetric flow rates for flow velocities of 1 foot per second and 0.5 foot per second in various sized flare headers.

Table 4: Flow as a Function of Header Size and Velocity

Volumetric Flow Rate for Given Flow Velocities (ft^3/hr)				
Flow Velocity (feet/sec.)	Diameter of Flare Header (inches)			
	24"	30"	42"	48"
1.0	11,310	17,671	34,636	45,239
0.5	5655	8836	17,318	22,619

Because most of the refineries have one or more large (42 inch or 48 inch) flare headers, using flow above 50,000 standard cubic feet per hour as a trigger ensures that sampling is triggered only when flow velocity is more than 1 foot per second in flare headers. Using an hourly trigger of 20,000 standard feet per hour (or about 330 standard cubic feet per minute over 15 minutes) ensures that sampling is triggered only when flow velocity is approximately 0.5 foot per second.

Several reasons support setting the trigger for sampling at a flow velocity of approximately 0.5 feet per second or higher. First, ultrasonic flow meters are not considered by manufacturers and users to be as accurate at flow velocities below about 0.5 feet per second.

Second, large flare headers are subject to various effects that produce low velocity currents within the header that do not represent flow to the flare. Such effects include the differential heating of a header by the sun producing stratification and circulation of gases and the suction of

a compressor producing a surging effect on gas in the header. As a result, eddies can form and move within a header. As a result of these effects, gas can move past the sensors of the flow meter when no flaring is occurring. With a lower trigger, flow may be indicated where none exists (i.e., a false positive flow). Under such circumstances, samples would not represent actual vent gas but would instead represent still gas in the header and could bias results.

A third reason for choosing the recommended trigger level is that an analysis of data collected during the District's flare study shows that use of this level would capture most of the flaring events of significance. Even if some events are missed, the larger events caught by this trigger will yield an extensive collection of data that will vastly expand understanding of the composition of flare gas.

A fourth reason for choosing this trigger level is that the data loggers used to record flare flow can be easily programmed to compare gas volume flared for the current minute against the trigger and to recognize when there are 15 consecutive minutes of flow about the trigger level. This will provide a clear signal for triggering sampling and can be easily enforced.

A fifth reason for choosing the proposed trigger level is that alternative forms appear to be more problematic. One alternative trigger that would still rely on the ultrasonic flow meter might be a sustained flow velocity exceeding 1 foot per second over some period of time. The disadvantage is that the sampling trigger would then vary with header size, which seems inequitable. In a small header the flow volume would be relatively inconsequential while significant in a large header. Use of a trigger other than the ultrasonic flow meter was also considered. A visual trigger tied to video monitor images could be used but would be subjective and difficult to enforce. Use of a trigger based upon flare header pressures that exceed the flare water seal pressure for some period of time would require instrumentation of water seals, and there is little District or industry experience with this data and its correlation to flow.

Continuous Analyzers

The other option for determining vent gas composition is the use of continuous analyzers pursuant to Sections 12-11-502.3.2 and 502.3.3. Several technologies are available: (1) flame ionization detectors (FID), (2) non dispersive infrared (NDIR), and (3) gas chromatography. These technologies were described above under "Background."

Continuous analyzers are widely used to monitor gas composition in the chemical and petroleum industry. However, District staff have been unable to identify any refinery in California or Texas using a continuous analyzer to monitor flare vent gas composition. One of the difficulties of monitoring vent gas is that it can include water, oil, rust and other particles, a very wide range of organic compounds, and high sulfur levels. In general, continuous analyzers need to be carefully tailored to a relatively predictable gas stream. In addition, samples need to be carefully conditioned to remove water and particles. Use of continuous analyzers will therefore require design and installation of a sample conditioning system. There is no off-the-shelf system available for this service. While District staff believe that such a system can be made to work, the technological challenges are not fully known. Until these systems are designed and installed, the maintenance needs for such a system are unknown. Because of the nature of the vent gas

stream, it seems likely that these sample conditioning systems will require more maintenance than those in more conventional service.

Rationale for Options

The rule allows the two primary options, sampling and continuous analyzers, because each has advantages and disadvantages that may dictate one over the other for the specific flare in question. Sampling is a proven approach. Though continuous data is desirable, continuous analyzers have not yet been proven as a technology to monitor flare vent gas, which is not as "clean" as most gas streams for which these analyzers are used. Use of continuous analyzers will require sample conditioning equipment that may be more difficult to design than those required for sampling and may require considerable maintenance. The rule represents a compromise, allowing a method that is known to work (sampling) while encouraging a method that the District would like to see proven in practice (continuous analyzers). This ensures that the rule will work and avoids the risk of rule failure that would come from mandating only continuous analyzers and the missed opportunity that might come from mandating only sampling. District staff expects that the result may be the use of continuous analyzers on some flares and sampling on others. District staff expects that either approach will provide sufficient data to support the accurate characterization of flare gas composition.

General Requirements

Section 12-11-502.1 specifies requirements that apply to all composition monitoring. Vent gas monitored for composition must be taken from a location that is representative of vent gas composition. Where flares share a common header, a sample from the header is sufficient for all flares served by the header. The composition monitoring system must provide a means for the District to take samples to verify the composition analyses required by the rule.

Section 12-11-503 Pilot Monitoring

This section requires each pilot to have a properly functioning ignition system. Most flares have pilot lights and most have an electric arc backup in case the pilot is lost.

Section 12-11-504 Pilot and Purge Gas Monitoring

This section requires monitoring of pilot and purge gas either by a flow measuring device or by the monitoring of other parameters. Most of the refineries rely on water seals rather than purge gas, and volumetric flow of pilot gas is constant and dictated by pilot design. Under these circumstances, the monthly report can simply state the parameters that dictate flow and repeat the flow data each month (see discussion of Section 12-11- 401).

Section 12-11-505 Recordkeeping Requirements

Pursuant to this section, monitoring records, except for video monitoring, must be kept for 5 years. The section repeats existing requirements contained in federal law for Title V facilities.

Section 12-11-506 General Monitoring Requirements

General monitoring requirements that apply to all monitors are included in this section. The section limits hours of monitor inoperation and requires reporting when monitors go out of service. Monitors are allowed 15 consecutive days of inoperation, with proof of expeditious repair required after the 15 days and with a limit of 30 days total in one year. During periods when monitors are out of service, flows must be calculated and composition must be determined by sampling. Monitors are required to be maintained and calibrated in accordance with manufacturer's requirements. Finally, the section specifies that the electronic data loggers used to record data must be capable of one-minute averages and must record flow data as one-minute averages. Continuous composition analyzers do not produce one-minute averages, as the cycle for such an analyzer may take 15 minutes or more.

The revised rule includes amendments to the monitor downtime provisions that are intended to encourage the use of integrated sampling and continuous analyzers. Though these approaches have not yet been used on flare headers, several Bay Area refineries are interested in trying one or more of these options, but are concerned that the downtime provisions are too stringent for new equipment with which they have no experience. The changes to this section allow a 6 month grace period for integrated sampling, continuous analyzers, and gas chromatography during which the downtime limits will not apply. This will give the refineries time to work out any problems and acquire experience with the new equipment.

In response to comments from the Air Resources Board received just before the May 21, 2003 hearing on the revised rule, District staff are proposing two minor changes to Section 12-11-506.1 of the revised rule. The first change would delete an allowance of monitoring downtime for purely manual sampling, for which a downtime allowance is inappropriate (see response #127 in Comments and Responses). The second change would correct a typographical error in the same section (see response #128).

Section 12-11-507 Video Monitoring

This section requires the installation within 90 days of recording equipment for flares currently equipped with video monitoring equipment. Effective in 6 months, video monitors and recording equipment must be installed on each flare that currently lacks video monitoring equipment and that has a significant release (1 million standard cubic feet of vent gas in 24-hour period) as measured by the ultrasonic flow monitors.

The video monitoring requirements are intended to provide a backup to the extensive data that will be available after the rule's other monitoring requirements go into effect. Recorded video will serve as a broad scale verification on the operation of flow monitors. For instance, if recorded video shows a significant flaring event that is not indicated in monitoring data, this would be indicative of monitor equipment failure. In this way, recorded video data will provide an additional benefit in linking actual flaring events with emissions data and will thereby further the District compliance and enforcement capabilities. Though recorded video is not nearly as useful as other forms of monitoring for determining the quantity or character of flare emissions, its low cost and utility as a gross verification method justifies its inclusion in the rule.

Community members originally asked for video monitoring so that the District would have the means to verify complaints about flaring. In the past, flaring complaints occasionally came to the District on weekends or at other times when a District inspector was unable to verify the complaint. In the past, however, inspectors did not have the flow and composition data that will now routinely be available. It is possible, but uncertain, that video data will assist the District in responding more effectively to community complaints. The District believes this possibility, combined with the usefulness of video data as a broad scale verification on monitor function, justifies imposition of the requirement. With the proposed rule, video data will be redundant, but the recordings will provide an additional check on flaring.

At the District's August 2002 conceptual workshop for the proposed rule, community members asked for video monitoring with retention of images for a period sufficient to allow verification. The District's original proposal was to require recording of images and retention of the images for 72 hours. At community meetings, many participants requested retention for a greater length of time. The proposed rule therefore requires retention and submission of the images recorded during a particular month with the monthly report required by Section 12-11-401. This requirement ensures that images will be available to answer questions raised by neighbors or by District staff after reviewing the report.

This section specifies certain minimum requirements for the images and recording. The flare image must be of sufficient size, contrast, and resolution to be readily apparent in the overall image or frame and it must include an embedded date and time stamp.

The image of the flare must be recorded at a frame rate of no less than 1 frame per minute. This frame rate was selected to ensure that the resulting size of the electronic file was no bigger than could be recorded on one DVD per flare per month. In arriving at this frame rate, the District assumed that the individual image file for each image of the flare would be 40 kilobytes. This file size was selected based on the size of a typical JPEG image file of reasonable size. Images for one month would then produce a file of 1.7 gigabytes (40 Kb * 60 min/hr * 24 hrs/day * 30 days). A single-sided single-layer DVD is capable of holding 4.7 gigabytes of data. Though this file size is reasonable for a DVD, it is an extremely large file by internet standards and could not be sent as a typical e-mail attachment or over anything but the fastest internet connections in any reasonable amount of time.

Comments on earlier versions of the rule have suggested that much higher frame rates could be required for the image recordings. But there are tradeoffs. The basic determinants of the size of an electronic image file are its size in pixels, the bit depth for each pixel (the number of bits used to represent colors for each pixel), the number of images included in the file (determined by the frame rate and length of time), and the compression used (various different approaches are used to reduce file size, but generally at the expense of resolution).

As an example, a typical image size is 320 pixels by 240 pixels. Producing a black and white image requires a bit depth of 1 bit. To produce a good grayscale image or an image with a limited range of color requires a bit depth of 8 bits. With limited color, the file size for each frame is already 75 kilobytes (320 pixels * 240 pixels * 8 bits/pixel * 1 byte/8bits * 1

kilobyte/1024 bytes). At a frame rate of 30 frames per second (the standard video frame rate), the file size for 1 minute of video is 132 megabytes. A DVD could store 36 minutes of these uncompressed video images. This is why compression is used. The standard compression used for video was developed by the Moving Pictures Experts Group and is called MPEG. MPEG achieves good results at compression ratios up to 20:1 for video, with visual artifacts and distortion appearing at higher compression ratios. With the current example and a compression ratio of 20:1, a DVD could store about 12 hours of video images. Video images of the example size at 30 frames per second for a single flare for a month would therefore require 60 DVDs.

One participant in the August 2002 conceptual workshop also suggested requiring flare operators to put flare images on the internet. The proposed rule does not require posting of images on the internet. The District believes that the current video monitoring requirement will sufficiently provide the information the District seeks to carry out its responsibilities. Web posting, as proposed by some workshop participants and commenters, would not provide any additional benefit in determining emissions, enforcing applicable regulations, or investigating incidents. If the District receives complaints as a result of a flaring incident, an on-site investigation by an inspector would normally follow.

On May 21, 2003 following the initial hearing on the rule, which included a discussion of "webcasting" by the Board, the District convened a meeting of the flare workgroup to discuss webcasting and other issues raised at the hearing. The meeting was attended by representatives for WSPA, the individual refineries, refinery trade unions, and CBE. The consensus of all present was that webcasting raises a number of difficult issues and should be separated from the remainder of the rule and referred to the Stationary Source Committee. The staff proposal for the June 4, 2003 Board meeting reflects this consensus. To avoid imposing video recording and storage requirements that would require immediate decisions about technology that might prove to be inconsistent with later direction by the Stationary Source Committee, the District is proposing to push back the effective date of Section 12-11-507 to allow further study of webcasting and related issues. The section would be effective 180 days after rule adoption rather than 90 days to allow the necessary time for this effort.

Manual of Procedures

Provisions in the Manual of Procedures section of the rule specify test methods to be used to carry out the monitoring required by the rule.

Section 12-11-601 Testing, Sampling, and Analytical Methods

This section lists the methods that are allowed for the various approaches to composition monitoring. Section 12-11-601.1 specifies methods to be used for laboratory analysis of samples taken manually or with an auto-sampler. Section 12-11-601.2 specifies methods to be used with flame ionization detectors or non-dispersive infrared spectrophotometry. Section 12-11-601.3 specifies methods for gas chromatography. For gas chromatography, although equipment may be capable of completing cycles in 15 minutes, the allowed sampling frequency is 30 minutes, both because some refiners may want to analyze for additional compounds beyond

those required by the rule, which increases the cycle time, or because some may want to use one gas chromatograph to analyze samples from more than one flare header.

The revised rule makes a minor change to this section to allow use of subsequent revised versions of the listed methods.

Section 12-11-602 Flow Verification Test Methods

Section 12-11-402 requires a semi-annual flow verification for the flow monitors required by the rule. As noted in the discussion of that section, this requirement simply provides a check on the flow meters. Section 12-11-602 specifies 6 methods that can be used to measure or estimate flow for a particular period of time. Pursuant to Section 402, the measure or estimate will then be compared to flow monitor data for the same period. If there is a difference between the data produced by the monitor and that produced by the verification method, it is difficult to know whether the error lies with the meter or with alternative. The verification is primarily intended to flag any major differences for further investigation. The verification would catch, for example, any error in the range setting for the ultrasonic flow meter (see discussion under Section 12-11-402). If there is a reason to suspect a problem in the flow meter, a flow meter can be removed and bench tested with controlled flows.

The revised rule includes a requirement that measurement from the meter and the flow verification agree to within ±20%.

Sections 12-11-602.1 and 602.2 allow pitot tube traverses as a check on flow and specify District and EPA methods respectively for conducting these traverses. These methods involve inserting a pitot tube into a port in a flare header and measuring flow. Though the methods have been included, they are not likely to be used very often because of the risks involved with inserting probes into a live flare header. Their use is also limited to velocities greater than 10 to 20 feet per second.

Section 12-11-602.3 would allow the use of flow monitors or process monitors that can provide comparison flow rate data for a vent stream that is flowing past the ultrasonic flow meter.

Section 12-11-602.4 would allow the use of any method recommended by the manufacturer of the ultrasonic flow meter.

Section 12-11-602.5 would allow the use of a tracer gas to determine flow. A tracer gas can be introduced into a flare header through a port upstream of a second port at which vent gas is sampled for presence of the tracer gas. By timing how long it takes the tracer gas to move from the port where it is introduced to the port where it is detected or by measuring the tracer gas concentration, flow velocity can be determined.

Section 12-11-602.6 would allow any alternative method if approved by the District and EPA.

EMISSIONS REDUCTIONS

The purpose of Regulation 12, Rule 11, Flare Monitoring at Petroleum Refineries is to gather information on flaring including flow, composition, and cause. The proposed rule does not mandate reductions. Nevertheless, District staff have found that because refiners have looked more closely both at monitoring and the feasibility of flaring reductions, flaring at the five Bay Area refineries has dropped dramatically over the past year. One refinery has installed new compressors that have allowed it to go from flaring an average of 5 million standard cubic feet of vent gas per day to virtually zero routine flaring. The result has been a significant emission reduction that cannot be directly attributed to this rule, but will ultimately be reflected in the emissions inventory.

ECONOMIC IMPACTS

Costs

The proposed rule requires the installation of 3 types of monitoring equipment: (1) flow monitoring equipment, (2) composition monitoring equipment, and (3) video monitoring equipment. Because the rule allows each refinery options, particularly in determining how to monitor vent gas composition, it is difficult to predict cost for each refinery. Cost will also vary because the number of flares at each refinery varies. Costs are divided into two main categories: (1) initial capital and installation costs for equipment, and (2) annual operating and maintenance costs.

Table 5. Capital Cost Items

Cost Item	Cost[1]	Comment
Flow monitor		
Ultrasonic meter w/ installation	$50,000	
Annual amortized cost[2]	**$6164**	
Continuous analyzer (NDIR)		
Hydrocarbon analyzer	$9,000	2 analyzers: (1) dual channel-methane and total hydrocarbon, (2) H_2S
H_2S analyzer	$15,000	
Sample conditioning	$40,000	
AutoCal system	$25,000	
Installation	$50,000	
Total	$139,000	
Annual amortized cost[2]	**$17,137**	
Continuous analyzer (FID)		
Hydrocarbon analyzer	$12,000	2 analyzers: (1) dual channel-methane and total hydrocarbon, (2) H_2S
H_2S analyzer	$15,000	
Sample conditioning	$40,000	
AutoCal system	$25,000	
Installation	$50,000	
Total	$142,000	

Cost Item	Cost[1]	Comment
Annual amortized cost[2]	**$17,507**	
Continuous analyzer (GC)		
GC	$50,000	
Sample conditioning	$40,000	
Installation	$50,000	
Total	$140,000	
Annual amortized cost[2]	**$17,261**	
Auto-sampling system		
Auto-sampler	$15,000	
Installation	$15,000	
Total	$30,000	
Annual amortized cost[2]	**$3,699**	
Manual sampling station		
Installation	$10,000	
Annual amortized cost[2]	**$1233**	
Video monitoring		
Equipment w/installation	$5,000	
Annual amortized cost[2]	**$616**	

[1] Costs based on vendor estimates or quotes to ARB or District staff
[2] Costs amortized over 10 years @ 4% real interest rate

Table 6. Annual Operating Costs

Cost Item	Cost	Comment
Maintenance for all monitors (per flare)	$20,000	District estimate
Sample analysis	$500/sample	Vendor quote
Report preparation per flare[1]	$4,000	Costs based on 1 day of labor @$50/hr/flare/month

Based on the above cost estimates, the annual cost per flare will depend upon the flare monitoring technologies chosen, but the cost is expected to be about $50,000 per flare. For flares for which composition is monitored by sampling, equipment costs are lower but sample analysis costs bring total cost up to a level comparable to that for flares using continuous analyzers.

At an annual cost of $50,000 per flare, the total cost for the Bay Area refineries together is expected to be about $1.15 million per year. The cost per refinery will depend upon the number of flares at the refinery.

Socioeconomic Impacts

Section 40728.5 of the Health and Safety Code requires an air district to assess the socioeconomic impacts of the adoption, amendment, or repeal of a rule if the rule is one that "will significantly affect air quality or emissions limitations." The proposed rule is intended to provide the tools necessary to analyze refinery flaring. It would impose monitoring requirements for refinery flares but would not impose emission limitations. As a result, these limits cannot be said to "significantly affect air quality or emission limitations," within the meaning of Section 40728.5, and the District will not prepare the socioeconomic analysis that would otherwise be required under Section 40728.5 of the Health and Safety Code. However, the District has attempted to minimize the costs imposed by the proposed rule.

Incremental Costs

Under Health and Safety Code Section 40920.6, the District is required to perform an incremental cost analysis for a proposed rule under certain circumstances. To perform this analysis, the District must (1) identify one or more control options achieving the emission reduction objectives for the proposed rule, (2) determine the cost effectiveness for each option, and (3) calculate the incremental cost effectiveness for each option. To determine incremental costs, the District must "calculate the difference in the dollar costs divided by the difference in the emission reduction potentials between each progressively more stringent potential control option as compared to the next less expensive control option." Because the proposed rule does not impose control requirements, no incremental cost analysis will be prepared.

ENVIRONMENTAL IMPACTS

Pursuant to the California Environmental Quality Act, the District prepared an initial study for the proposed rule to determine whether rule adoption would result in any significant environmental impacts. The rule is intended to allow the District to collect data on refinery flaring through the imposition of monitoring requirements. Because the rule would not impose emission control requirements, which always have some potential to alter emissions or transfer them from one media to another, and because any necessary construction would take place within existing refineries, no adverse environmental impacts are expected. The study did identify the construction work required to install monitors as a source of potential environmental impacts. However, because of the safety requirements that govern this type of work, the regularity with which similar hot work is conducted in refineries, and the consequent familiarity with and preparedness for this type of work on the part of refinery workers and contractors, the study concluded that the proposed rule would not result in any significant environmental impacts through this mechanism.

A CEQA Negative Declaration is proposed for adoption by the Board in connection with the adoption of the revised rule. The CEQA document was circulated for public comment during the period from April 21, 2003 to May 12, 2003. No comments on the document were received.

REGULATORY IMPACTS

California Health and Safety Code Section 40727.2 require the District to identify existing federal air pollution control requirements for the equipment or source type affected by the proposed rule or regulation. The District must then note any differences between these existing requirements and the requirements imposed by the proposed rule. Table 7 is a matrix of the proposed rule, existing Bay Area regulations, and federal requirements for flares.

Table 7: Comparison of Regulatory Requirements

Agency	Regulation	Control/Performance Requirements	Monitoring Requirements	Emission Limitations
BAAQMD	Reg. 2, Rule 6 (Title V permit)	Specific to facility and source	Specific to facility and source	Throughput limits, visible emission
BAAQMD	Proposed Reg. 12, Rule 11	No	Volumetric flow and composition	No
EPA	40 CFR 60.18 (applies to flares subject to NSPS)	Pilot flame present at all times, heat content, maximum tip velocity, sulfur content	Presence of flame, heating value	Smokeless capacity

Federal Requirements

Federal New Source Performance Standards (NSPS) in 40 CFR Part 60, Subpart A, Section 60.18 apply to flares that are used as general control devices. They specify design and operational criteria for new and modified flares. The requirements include monitoring to ensure that flares are operated and maintained in conformance with their designs. Flares are required to be monitored for the presence of a pilot flame using a thermocouple or equivalent device. Other parameters to be monitored include visible emissions, exit velocity and net heat content of the gas being combusted by the flare.

In addition, the NSPS limit sulfur oxides in vent gases combusted in a flare installed after June 11, 1973 (40 CFR Part 60, Subpart J, Section 60.104). Upset gases or fuel gas that is released to the flare as a result of relief valve leakage, startup/shutdown, or other emergency malfunctions is exempt from the standard.

District Requirements

Within the District, a new emission source or a modified existing source must meet the District's New Source Review (NSR) requirements. The NSR program requires the use of Best Available Control Technology (BACT) for new or modified sources that have the potential to emit 10 pounds per day or more of VOC, carbon monoxide, oxides of nitrogen, particulate matter, or

sulfur dioxide. For flares, BACT requires a control efficiency of 98% for elevated flares and 98.5% for ground flares. Other permit conditions are imposed on some flares. These conditions may include throughput limits and record keeping to document compliance.

The proposed rule would require continuous monitoring for volume and sampling or the use of continuous analyzers for vent gas composition. Recording of video images of flares would be required. Monthly reports of flow, composition, and other data would be required. For larger releases (over 1 million standard cubic feet per day), a report on the time, cause, duration, and reason for the flaring would be required.

RULE DEVELOPMENT HISTORY

The District has been carrying out a complex study of flares and flaring at the Bay Area refineries since January 2002. The study implements further study measure FS-8 from the 2001 Bay Area Ozone Attainment Plan. In the course of the study, District staff have visited all five Bay Area refineries numerous times, have met with refinery staff, ARB and EPA staff, and with community groups in over 50 meetings to discuss issues related to flaring.

A work group was formed to carry out the further study. The workgroup included representatives from California Air Resources Board, Industry, Communities for a Better Environment, and District Staff. The Environmental Protection Agency and other air districts, including the South Coast AQMD and the San Joaquin Valley Unified APCD participated at various levels throughout the project. The workgroup has met periodically since January 2002 to discuss technical issues. Among those issues have been flare monitoring issues such as flow monitoring and available technologies and composition monitoring methods.

In May 2002, the District conducted an informational public meeting to gather input on the District's plans to implement the commitments in the ozone attainment plan. In August 2002, District staff held a workshop in Martinez to discuss flare monitoring concepts. At this workshop, community members indicated that they would like to see a rule that required flow monitoring, composition monitoring, reporting requirements, and video monitoring.

Three community meetings were held in March and April 2003. After the community meetings, a draft rule was circulated for a short comment period ending April 17, 2003. Extensive comments were received from WSPA, Communities for a Better Environment, and refinery trade unions. On April 16, 2003, the proposed rule was discussed before the Stationary Source Committee. A flare workgroup meeting was then held on April 18, 2003. The meeting was attended by representatives for various refineries, WSPA, CBE, the refinery trade unions, monitoring equipment vendors, ARB, and District staff. Based on the draft and these further discussions, the proposed rule was developed and sent to the Air Resources Board on April 21, 2003. Discussions continued on May 8, 2003 with a second flare workgroup meeting. After the second meeting, modifications to the proposed rule were developed and circulated among all who participated in the meeting. After discussion with members of the workgroup, staff prepared the revised rule.

DISTRICT STAFF IMPACTS

Implementation of the proposed regulation will have a significant impact on the District's resources. However, these changes are essential and necessary in order to satisfy the commitments in the Bay Area 2001 Ozone Attainment Plan.

The proposed regulation will require the installation of monitors. The District will have to exercise oversight for these monitors in a manner similar to that used to oversee continuous emission monitors (CEM). The resources required are similar, and will require District staff to verify the installation of monitoring equipment, conduct accuracy tests or ensure that they are conducted, review monthly reports, perform compliance inspections, and investigate flaring incidents.

Monthly reports on flaring will be required. These reports will have to be reviewed by District staff. The District expects to continue to investigate significant flaring events. This would not represent a change from the model used in the further study measure for flares. A flaring event was defined for the study as any flow over 1,000,000 standard cubic feet per day to a flare. The rule requires an investigation that is included in the monthly report from the refinery whenever daily volume exceeds 1,000,000 standard cubic feet. During the further study period, the time required to investigate events varied, was dependant on the complexity of operations, and ranged from less than an hour to hundreds of hours. This workload will diminish as flaring decreases (as it is currently) and as more data becomes available with new monitors in place.

CONCLUSION

Proposed Regulation 12, Rule 11, Flare Monitoring at Petroleum Refineries, will implement control measure SS-15 from the Bay Area 2001 Ozone Attainment Plan. The rule is intended to gather data on flaring operations at petroleum refineries.

Pursuant to the Health and Safety Code Section 40727, new regulations must meet necessity, authority, clarity, consistency, non-duplicity and reference. The proposed regulation is:

- Necessary to implement control measure SS-15 in the Bay Area 2001 Ozone Attainment Plan;
- Authorized by California Health and Safety Code Section 40702;
- Clear, in that the new regulation specifically delineates the affected industry, compliance options and administrative requirements for industry subject to this rule;
- Consistent with other District rules, and not in conflict with state or federal law;
- Non-duplicative of other statutes, rules or regulations; and
- The proposed regulation properly references the applicable District rules and test methods and does not reference other existing law.

REFERENCES

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_____. Air Pollution Technology Factsheet: Thermal Incinerator. Washington, D.C. (available on the web at http://www.epa.gov/ttn/catc/dir1/fthermal.pdf)

COMMENTS AND RESPONSES

The following written comments were received during the rule development process for the proposed flare monitoring rule. These comments and responses refer to the rule prepared and made available with the public notice for the May 21st hearing as the "proposed rule." This is in keeping with standard terminology used by ARB, air districts, and the Health and Safety Code (§§40725, 40726). The revised version of the rule now proposed for adoption is called the "revised rule." Earlier drafts of the rule are called "earlier drafts." These comments were made on an earlier draft that preceded the proposed rule. Many of the comments were addressed in the proposed rule or in the revised rule that staff is recommending for adoption by the Board.

Written Comments Received During Community Meetings

The District held three community meetings in March and April 2003 to discuss rule concepts. During or after these meetings, the District received the following written comments related to an earlier rule draft.

1. The draft rule allows refineries to choose once per day sampling and skip monitoring gas composition for the rest of the day. Refineries are only required to sample gas composition during 60 minute periods exceeding 50,000 cubic feet of gases flowing to the flare. This loophole allows each flare to skip monitoring the gas composition of over a million cubic feet per day of gases (49,000 cubic feet X 23 hours). <May, Communities for a Better Environment (CBE). E-mail. 3/27/03>

For the sampling option to which the comment refers, the earlier draft rule set a trigger that required sampling when the volume of vent gas measured during a 60-minute period exceeded 50,000 standard cubic feet of gas. Based in part on a concern expressed in earlier comments, the trigger was revised downward in the proposed rule and subsequently in the revised rule now recommended for adoption. The revised trigger that staff recommend is identical to the trigger in the South Coast AQMD rule (which requires sampling when flows continuously exceed 330 cubic feet per minute for 15 minutes).

Note that all vent gas must be monitored for flow <u>volume</u> regardless of the means used to determine composition. If sampling is used for monitoring vent gas <u>composition</u>, it is important that the trigger be set at some minimum flow that represents actual flow to the flare so that false positive readings are avoided. The earlier draft rule to which this comment was directed set a trigger that was based on an assumption that ultrasonic flow meters could not reliably measure flare flows at below 1 foot per second. The revised trigger is based on an assumption that there is adequate reliability even at approximately 0.5 foot per second.

As discussed in the staff report (see discussion of Section 12-11-502), large flare headers are subject to various effects that produce low velocity currents within the header that do not represent flow to the flare. With a trigger lower than approximately 0.5 foot per second, meter accuracy is lower, and low-velocity flows that do not represent flow to the flare may be encountered. The result is that flow may be indicated where none exists (i.e., a false positive flow). If samples are then taken, these "no flow" samples will bias results.

2. The draft rule allows huge flows of gases to go unmonitored because the refineries are allowed to skip measuring flows below 0.5 ft./sec. <May, CBE. 3/27/03>

The rule requires all flows to be measured and reported (see Section 12-11-401). The comment is a response to Section 12-11-501, which specifies a series of requirements for any device used to measure flow. One of the specifications is that the meter must measure the range of flow corresponding to velocities from 0.5 to 275 feet per second. This is a device specification and not a limitation on the reporting otherwise required by Section 12-11-401. An ultrasonic meter that meets the specification is capable of reporting data on flow down to its limit of detection. The specification is derived from literature from Panametrics. The Panametrics meter is capable of detecting flow down to 0.1 feet per second. As noted above, however, these low velocity flows may not represent flow to the flare.

3. The draft rule allows poor quality assurance procedures, such as "engineering calculations" or "other flow monitoring devices or process monitors" for determining whether [flow] monitoring equipment is working right. <May, CBE. 3/27/03>

Ultrasonic flow meters are state-of-the-art devices for measuring flow. They are extremely accurate over a wide range of flows, are robust with no moving parts, and are proven in service. They are widely used as custody transfer meters to price large volumes of natural gas at sale. Section 12-11-506.3 already requires proper calibration and maintenance. The verification procedures included in the rule are inevitably less accurate means of measuring flow, but are included in the rule as a check on the meters to avoid gross errors such as might come from misinterpreting the range setting or units represented by the meter display or output.

Written Comments Received During Written Comment Period

Following the completion of the community meetings, the District prepared a revised draft and made it, a draft staff report, and a draft CEQA initial study available for public comment. The comment period ran from April 7 – 17, 2003. The following comments were received.

4. What data/monitoring is needed for proposing rule-making? <Partnership for Public Health, Environmental Health Committee (PPH). 4/16/03>

For any rulemaking, the District must make a number of findings required by California Health and Safety Code section 40727. Findings of necessity and authority are among the required findings. For this rulemaking (flare monitoring), this staff report serves as the basis for the necessary findings.

5. What is the nature of the discrepancies between the Air District assessment and the assessment from the refineries? How will these discrepancies be addressed? What is the avenue for meaningful public participation in this process? <PPH. 4/16/03>

The major differences between the District's Draft Technical Assessment Document and data submitted by the refineries are in the hydrocarbon content and volume of gases flared. These differences will be addressed through the ongoing technical assessment process for flares. The public can participate through the flare work group or by commenting on the technical assessment document as revised.

6. Is routine flaring legal? If not, what does the Air District plan to do about these flares (i.e.; fines, cease and desist orders, control measures). <PPH. 4/16/03>

Under certain circumstances routine flaring may result in a violation of Federal standards (40 C.F. R. Section 60.104(a)(1)). Such a determination is based upon the factual circumstances in any given flaring event. Because the purpose of the current regulation is to gather data and monitor emissions, this question may be better answered in another forum.

7. What monitoring technology is currently available? What is the best way to monitor? <PPH. 4/16/03>

For flare gas flow rate (cubic feet per minute of gas vented to the flare), the current state-of-the-art monitoring technology is ultrasonic flow meters. For flare gas composition, there are various methods, including taking grab samples to be analyzed in a laboratory, continuous gas chromatographs that collect and analyze a sample every 15 minutes, and continuous monitors that measure methane, total hydrocarbons, and sulfur compounds. There are advantages and disadvantages for each monitoring method. Grab sampling and subsequent lab analysis is simple but labor intensive, provides a "snapshot" of composition for the instant when it was taken, but is not available until hours after the sample was taken. Continuous gas chromatographs are complicated, require complex sample conditioning systems, may need much maintenance, but provide very detailed composition information every 15 minutes. Continuous monitors for methane, total hydrocarbons, and sulfur compounds also require complex

sample conditioning systems but provide continuous composition information for these compounds.

8. What does monitoring tell us from an exposure standpoint and from a health effects standpoint? That is, how much exposure is the community getting and is this harmful to the health of the community members? Is there any additional concern for those who are chronically ill, are chemically sensitive, the young and the elderly? <PPH. 4/16/03>

Flare monitoring for flow rate and flare gas composition will provide data that can be used to calculate emissions. Dispersion models can be used to calculate the air quality impact of the flare emissions. These air quality impacts can then be used to estimate exposure. Health professionals can evaluate the health impacts. Generally speaking, young children, the elderly, and those with respiratory illness are more sensitive to air pollution than healthy adults.

9. Are all flares monitored? For instance, are there records of specific dates and times of flaring incidents over the last few months? <PPH. 4/16/03>

The information available today is limited. The District has been conducting a study of flaring with the available data and has posted on its website (www.baaqmd.gov) preliminary flaring data covering the period from January 2001 to August 2002. This data is preliminary and in many cases relies upon assumptions that may be revised. With new flare monitoring technology, much more reliable information will be available.

10. When flares are monitored, how quickly is the monitoring information available to residents? What is the Air District plan for public notification? <PPH. 4/16/03>

Refineries will be required to provide the District with a monthly report for each flare that will include flow and composition data. The District has not yet determined how best to provide this information to the public, but is considering the use of its website and perhaps other means.

11. What is the breakdown of the emissions? What specific chemicals are monitored and what chemicals that are emitted are not monitored? Why aren't all chemicals monitored? <PPH. 4/16/03>

Emissions come from two primary mechanisms: oxidation of flare gases to other compounds and incomplete combustion that allows a small portion of the flare gas to pass through the flare uncombusted. Flare gas is generally composed primarily of methane, non-methane hydrocarbons, nitrogen, and hydrogen with small amounts of other compounds, including sulfur compounds. The primary combustion products are carbon dioxide and water, but sulfur compounds are oxidized to oxides of sulfur. The flare monitoring rule focuses on composition monitoring for methane, total hydrocarbons, and sulfur compounds because

these compounds form ozone and sulfur dioxide, and health-based ambient air standards have been established for both pollutants.

12. How long will it be before the Air District implements measures that will reduce the amount of pollution being discharged by flares? <PPH. 4/16/03>

The District is currently completing its study of flares and expects to determine by summer how it will move forward to reduce flaring. The refineries have already significantly reduced flaring from 2001 and 2002 levels.

13. How will the information and input be gathered from this and other meetings and from monitoring be used in rule-making regarding flaring? What is the timeline for rule-making? How can residents be involved in this process? <PPH. 4/16/03>

Information provided from the public through the comment period, public hearings and other submittals and meetings have been considered in drafting the District's final monitoring proposal. We are still working on the flare study that will determine the next steps regarding potential controls on flares. Though the data we have developed through the study may not have the precision of the data that will come from the new monitors, it should be adequate to guide the District's decision about controls. The District expects that, if the study concludes that controls are available, the rule development effort to impose controls would be concluded by the end of 2003. The District will again consider comments that have already been received regarding controls, and residents will again be invited to participate and comment in the flare control rulemaking process.

14. Are you documenting each of our questions? How are you going to respond to the community concerns? <Asthma Community Advocate (ACA). 4/16/03>

The District is considering all comments and responding to all written comments. The proposed rule incorporates many community suggestions.

15. Will there be a timeline for creating and implementing the rule? <ACA. 4/16/03>

The District Board of Directors will conduct a public hearing on May 21, 2003 at which it will consider adoption of the rule.

16. Are there any consequences for the refineries if the designated timeline is not maintained? (fines, etc.) <ACA. 4/16/03>

Yes. Failure to meet rule requirements would be a violation of the rule subject to potential enforcement action and penalties.

17. Are the refineries going to be allowed to continue to use flares for planned and routine use? <ACA. 4/16/03>

The proposed flare monitoring rule does not impose restrictions on flare use. Consideration of flare controls is a separate process. See response to comment #13.

18. How will non-accidental uses of flares be regulated and monitored? <ACA. 4/16/03>

The proposed rule would require monitoring of all flaring events from flares subject to the rule, accidental or not. Also see response #17.

19. How will the public know what measures refineries are taking to implement technologies to reduce the need for flares in the first place? <ACA. 4/16/03>

Section 12-11-401 of the proposed rule requires that monthly reports on flaring include a description of any measures taken to reduce or eliminate flaring.

20. How will this information be provided to the community? <ACA. 4/16/03>

See response #10.

21. Do the refineries have to wait to implement pollution controls until this flare rule is developed? <ACA. 4/16/03>

No. One refinery has installed new compressors that allowed it to virtually eliminate routine flaring. Most of the refineries now have compressors that should allow them to avoid routine flaring. Nothing in this rule prevents refineries from moving forward with flare controls.

22. Why isn't the Air Board monitoring for hydrogen and nitrogen? <ACA. 4/16/03>

Hydrogen and nitrogen in the flare gas do not contribute directly to air pollution. When hydrogen is burned in a flare, it is converted to water. Flares use surrounding air to provide the oxygen for combustion. Air is about 20% oxygen and 80% nitrogen by volume. While a small amount of nitrogen in the air is converted to nitrogen oxides, which can contribute to ozone formation, nitrogen in flare gas would not increase emissions of nitrogen oxides.

23. Don't wait to implement pollution controls to reduce the need for flares-planned, routine or accidental! <ACA. 4/16/03>

See responses #13 and #21.

24. How is the public going to be notified about the findings of the flares? In real time? In plain English? What about the findings of the report? <ACA. 4/16/03>

Information about major flaring events is posted on the District's website. The monthly reports on flaring that are required by the proposed rule will be available to the public (see response #10). The flare study as revised will be available on the District website.

25. We feel that someone from the West County Asthma Coalition should be kept updated on a routine basis by the Air Board about the flare issue. <ACA. 4/16/03>

See response #24. We are happy to discuss flaring issues with the West County Asthma Coalition.

26. We recommend requiring continuous analyzers for vent gas monitoring. If there is a malfunction of that equipment then manual sampling should be used. <ACA. 4/16/03>

Continuous analyzers are an allowed option. Other options are allowed because continuous analyzers have never been installed on refinery flare headers, and the feasibility of this approach is not yet known.

27. What are penalties or consequences if the monitoring requirements are not met? <ACA. 4/16/03>

Failure to comply with the monitoring requirements would be a rule violation subject to potential enforcement action and penalties.

28. We understand that the positioning of the camera could influence the reading of the emissions from refineries. So, is it possible to have more than one video recording device monitoring flares? There should be a time and date stamp. <ACA. 4/16/03>

Cameras cannot be used to read emissions from flares. The rule requires monitoring of flow and composition using flow meters and other means that provide more reliable information than cameras. Cameras provide secondary information about the size and shape of the flame that cannot be used to determine the nature and quantity of emissions. The rule specifies minimum requirements for video monitoring. More than one camera would be allowed but not required. The proposed rule requires a time and date stamp.

29. Flare images should be retained for at least 7 days, as opposed to a minimum of 72 hours. We understand that storage has come up as an issue, but how big an inconvenience is too big an inconvenience to store small video digital tapes? <ACA. 4/16/03>

The proposed rule now requires that the flare images for each month be recorded and submitted to the District. Tapes are not a reliable storage means. It is expected that video information would be converted to digital files and archived on DVDs or other storage media.

30. Are video tapes going to be fully accessible to the public? Since this is public information, can it be available at public libraries or other public places, so the public won't have to necessarily go through a government agency for access to the videos. <ACA. 4/16/03>

It is unlikely that tapes will be used. It is more likely that images will be digitally recorded on DVDs or other media that can be read by computers. The District has not yet decided how to make the data available.

31. Periodically, will public sharing of flaring videos be scheduled and presented in plain English? We recommend that if the Air Board is given 24 hours notice, than any member of the public should be allowed to see any video. <ACA. 4/16/03>

See response #30.

32. How many years are you going to collect data before you require changes in industrial practices leading to a reduction in flares? <ACA. 4/16/03>

See responses #12 and #13.

33. What is your proof or data, that flare emissions are not impacting the health of the local community? <ACA. 4/16/03>

All air pollutants have the potential to affect health, particularly for the young, the elderly, and those with respiratory illness. Flares are just one of many contributors to air pollution. Many other sources, including cars and trucks, contribute emissions, including sulfur emissions, that are similar to those from flares. Given that these flare emissions are not unique and that the causes of asthma, cancer, and many other illnesses are not well understood, it is unlikely that flare emissions can be identified as being responsible for a particular health problem. Nor can it be proved that they are not responsible. In general, it is well known that ozone and sulfur dioxide can, for example, trigger asthma attacks. As a result, the District works to reduce these pollutants, regardless of the source.

34. Is there any proof that sulfur emissions from flares have no harmful health effects? <ACA. 4/16/03>

See response #33.

35. In general, sulfur components trigger asthma, what proof do you have that sulfur emissions from flares have no harmful health effects? <ACA. 4/16/03>

See response #33.

36. The short comment period has hampered our ability to thoroughly review the proposed rule. We strongly support a thorough and vigilant flare monitoring rule. We also support the detailed comments on this rule submitted by Communities for a Better Environment. <Holtzclaw, Sierra Club. E-mail. 4/17/03>

The District understands the difficulty. The District is moving quickly to establish a flare monitoring rule that is thorough and responsive. Given the District's desire for an expeditious and efficient process, the additional comment period was necessarily short.

37. We believe that web-posted video monitoring on real-time basis is necessary to establish and maintain a common tool for community, regulators and regulatees to reference in their communications. We urge the District to require that real time flare images be posted so that nearby folks can monitor the flares along with regulators and refinery personnel. With 24 hour real time video monitoring that is accessible, it may be possible to identify which wind and release conditions result in troubling air quality. <Holtzclaw, Sierra Club. 4/17/03>

The proposed rule does not require web posting for the reasons discussed in the staff report (see discussion of Section 12-11-507). The flow and composition monitoring requirements of the rule are a much more reliable source of the information that would be necessary to assess air quality impacts.

38. The exemption of Section 12-11-111 should include thermal oxidizers. Thermal oxidizers are highly efficient control devices, therefore all thermal oxidizer applications should be exempt from this rule. < Buchan, Western States Petroleum Association (WSPA). E-mail. 4/17/03>

Thermal oxidizers are by definition exempt from the rule, but the exemptions of Sections 12-11-110, 112, 113, and 114 have been modified to make this clear.

39. Modify the definition of "flare" to clarify the difference between flares and other combustion equipment. <Buchan, WSPA. 4/17/03>

The definitions of "flare" and “thermal oxidizer” have been modified to accomplish this.

40. A definition for “flare monitoring systems” is needed to identify all monitoring equipment that could fail and, therefore, come under the

equipment malfunction requirements of section 506.1. <Buchan, WSPA. 4/17/03>

The District has added a definition and clarified the monitor downtime provisions of Section 12-11-506.1.

41. A definition for "day" is needed to clarify its usage throughout the regulation. We believe that a calendar day would simplify various recordkeeping requirements and is appropriate. <Buchan, WSPA. 4/17/03>

The rule does not include the definition. Section 12-11-401.6 requires a "root cause" analysis if more than 1 million standard cubic feet of gas are flared in a 24-hour period. This analysis would be required when flaring begins in the evening, and the 1 million standard cubic foot threshold is reached after midnight. Use of "day" instead of "24-hour period" would mean no analysis would be required under these circumstances.

42. Changing the report due date to the end of the following month aligns the deadline for the flare reporting with several other monthly report deadlines so the reports can be submitted together. <Buchan, WSPA. 4/17/03>

Section 12-11-401 has been modified to include this deadline.

43. Adding an "(s)" to the reference [in Section 12-11-401] to flare headers clarifies the reporting requirements for flare systems with one or more headers feeding the same cascading or staged flare system. <Buchan, WSPA. 4/17/03>

Section 12-11-401 has been modified to make it clear that only one report is required for such a system rather than individual reports for each flare in the system.

44. Deletion of requirements for hourly data in section 401.1 and 401.3 is proposed because we believe that hourly data is overly burdensome and is not needed to determine emissions from the flares. <Buchan, WSPA. 4/17/03>

Hourly data will be generated by the monitors and can be easily provided in electronic format. During large flaring events, emissions can change significantly from hour to hour.

45. Changes to section 401.4 are proposed to simplify the wording regarding purge gas data in the monthly report. <Buchan, WSPA. 4/17/03>

The District believes the proposed language is clear. The suggested language would allow submission of daily averages under circumstances where more detailed data is available. Where purge gas use is at a fixed rate, it would be permissible with our language to submit the daily average.

46. Changes are proposed in section 401.6 to clarify the accumulation time for the 1.2 million standard cubic feet of vent gas and a requirement for hourly flow during such periods was added to ensure adequate data is collected for such flaring events. <Buchan, WSPA. 4/17/03>

See response #41.

47. The use of a 24-hr period unnecessarily compounds the data capture and reporting task. Instrument data is normally archived and presented in a simplified midnight to midnight basis. The use of another 24-hr period will require the execution of additional manual tasks that may result in a loss of the data automation accuracy from flow recording systems. Additionally, routine duties such as monitoring of flare event periods should match as closely as possible, the normal work routines and schedule of refinery personnel. The introduction of a task that is triggered by an unpredictable monitoring activity will require additional task execution by the operators. <Buchan, WSPA. 4/17/03>

See response #44. Flow monitor data loggers can be easily programmed to recognize when the threshold has been reached. With either the proposed language or the WSPA language, the threshold could be reached at any hour of the day.

48. We are willing to provide emissions calculations on using the 98% control efficiency basis. However, we wish to note that there are several studies that indicate that the flare hydrocarbon destruction efficiencies are typically higher than 98%. Therefore, the emission calculations will very likely be overestimating the actual flare hydrocarbon emissions. This fact should be taken into account when considering possible uses for these emission numbers. <Buchan, WSPA. 4/17/03>

Comment noted.

49. [In Section 12-11-501,] the minimum velocity should be 0.5 feet per second(fps) or 0.34 MPH. Based on our experience and the experience in the SCAQMD, a 0.5 fps zero cutoff will create false vent gas flow readings. These false readings are primarily caused by eddy currents and temperature changes within the flare stack. Due to the sensitivity of the flow meter at this very low flow setting, gas expansion due to daily changes in ambient temperature will result in signals of non-existent vent gas flows. Upon receiving these false signals, the operator must then monitor and report these "ghost" flows per 12-11-401 on a daily basis. To avoid this unnecessary low flow indication and subsequent reporting of these miniscule false flows and false emissions, we request that the minimum velocity be 0.5 fps. <Buchan, WSPA. 4/17/03>

The rule specifies that the flow monitoring device must continuously measure flow velocity from 0.5 to 275 feet per second because this is the range over which ultrasonic flow meter manufacturers (Panametrics and Roxar) guarantee highest accuracy. But Section 12-11-401 requires continuous flow monitoring and reporting of all flow data, not just flows above 0.5 foot per second.

50. The requirement in Section 501.3 that the flow monitoring device continuously measure molecular weight should be to allow maximum flexibility in the type of flow meter used. Currently, the most likely type of flare flow meter does allow a continuous measurement of molecular weight. However, other acceptable flow monitoring instruments may become available and the molecular weight requirement may prevent use of any other flow instruments, limiting the flow monitoring to a single supplier. <Buchan, WSPA. 4/17/03>

This requirement has been removed from Section 12-11-501. Section 12-11-401.4 now specifies that this information must be reported if available from the meter.

51. Section 502.2 does not allow enough time to properly design, review, order, and construct a safe sampling system. The section should be changed to allow 90 days. <Buchan, WSPA. 4/17/03>

The section now allows 90 days rather than 60.

52. The minimum sampling frequency of once per day [in Sections 502.2 and 502.3] does not make sense if there is no flow. <Buchan, WSPA. 4/17/03>

We have eliminated the requirement for daily sampling in favor of a trigger that would require sampling only when there is flow to the flare.

53. The rate [of 50,000 standard cubic feet in one hour] triggering sampling and the frequency of sampling required [every 3 hours] seems excessive. We propose increasing the trigger for frequent sampling to a 100,000 standard cubic feet event in one hour. This would still identify very small events (less than 50 pounds of hydrocarbon using typical vent gas composition). Sampling even smaller events would not provide any significant information and would significantly increase the cost for sampling and analysis. In addition, it would allow operators to focus on stopping even small flaring events rather than concentrate on verifying that samples have been taken for insignificant events. Also, we propose that the frequency for sampling such events should be reduced to once every 8 hours. Generally, the vent gas composition during a flaring event does not change significantly over a period of 8 hours. Therefore, a sampling frequency of once every 8 hours should be adequate. <Buchan, WSPA. 4/17/03>

In the proposed rule, the trigger for sampling was set at 6,000 standard cubic feet in 15 minutes. However, staff is now recommending that the trigger be modified to be identical to the trigger used in the South Coast AQMD rule (330 standard cubic feet per minute continuously for 15 minutes). This change is included in the revised rule.

To address community concerns that a sampling interval measured in hours would mean that composition would go unmonitored for too long during flaring events, the proposed rule specified integrated sampling at 15 minute intervals. Integrated sampling produces a composite sample out of aliquots (portions of the total sample size). Because the aliquots are taken over time, the sample reflects variation in composition that may occur over time. However, because this eliminated conventional sampling and meant that expensive sampling equipment or continuous analyzers would be required for numerous flares that are rarely used, recommended changes are included in the revised rule to add back a conventional sampling option with a sampling interval of three hours. Integrated sampling provisions are also retained.

54. Section 506.1 changes are made to clarify that all monitoring equipment (see added definition for "flare monitoring system") come under this section. Flare monitoring will require a significant amount of equipment. Since much of this monitoring will be new installations and will involve monitoring that has not typically been done in this application, it is likely that there will be more instrument downtime than an old, existing monitoring requirement. Therefore, we recommend that the wording in this section be made consistent with the continuous emission monitoring requirements found in Regulation 1-522.4. To accomplish this, the last sentence in 12-11-506.1 should be deleted. <Buchan, WSPA. 4/17/03>

Rather than eliminate the sentence that limits downtime to 30 days in a calendar year, staff is recommending changes to the proposed rule to allow a 6-month delay in this requirement for integrated sampling, gas chromatography, and other continuous analyzers to allow time to identify and correct problems in the systems before the requirements come into effect.

55. Section 506.2 requires manual sampling during periods of inoperation of continuous analyzers. This should extend to auto-samplers. We believe this was the District's intent. <Buchan, WSPA. 4/17/03>

This was our intent, but the change was not included in the proposed rule. The revised rule includes this change.

56. Section 506.4 changes clarify that many in-line analyzers cannot provide one-minute averages since the analytical sampling period is greater than once per minute. For example, most if not all hydrogen sulfide analyzers have a response time of 3 minutes or longer. Gas chromatography analyzers take 30 minutes or more for a complete analysis. Therefore,

since many analyzers are incapable of providing one minute data, let alone averages, that portion of the section should be removed. <Buchan, WSPA. 4/17/03>

The section indicates that the data logger must be capable of recording one-minute averages. The District recognizes that composition data will not be one minute averages and need not be recorded as such.

57. The requirement to archive video images for each 24-hour period should be changed to a requirement to archive the images for each day to clarify daily archiving of daily video monitoring. <Buchan, WSPA. 4/17/03>

The proposed language change would not change the requirement. The "24-hour" language was used to allow flexibility to produce a daily archive that runs from, for example 12 noon to 12 noon, rather than limiting it to a 12 am to 12 am day.

58. EPA commonly allows an Equivalent Voluntary Consensus Standards Body to determine the most appropriate methods for analyses. Examples of this are ASTM, API and others. In this way, the rule need not be opened each time a more accurate, sensitive, or appropriate method is deemed more suitable for the analysis. <Buchan, WSPA. 4/17/03>

The text of the proposed rule, in Section 12-11-601, did not address this issue. The revised rule addresses the issue, and allows subsequent revisions to methods to be used.

59. Initial Studies with proposed Negative Declarations or Mitigated Negative Declarations require at least 20 days for public comment (30 days if submitted to the State Clearinghouse). See California's Environmental Quality Act (CEQA) Guidelines, Sec. 15073(a). The BAAQMD published its Request for Comments online on April 7, 2003. Since comments are due today, April 17, 2003, the District has provided merely 10 days for public comment. Accordingly, OCE request that the District provide an explanation for the abbreviated comment period. <Costa, Our Children's Earth Foundation (OCE). E-mail. 4/17/03>

The document on which comments were requested was a draft initial study. No public review of a draft initial study is required by CEQA. Initial studies typically serve as the basis for an agency's conclusion about the appropriate CEQA document required for a project. If an agency decides that a negative declaration is the appropriate document, it must, at that point, indicate that it intends to adopt a negative declaration (which includes the initial study) and provide for the review period required by CEQA Guidelines section 15073. The District has now made the negative declaration for this rule development project available for a review period exceeding 20 days. In asking for any comments on the draft initial study,

the District was providing an opportunity for comment beyond those required by CEQA.

60. The BAAQMD's flare monitoring rule should require that the District take stack samples during flaring incidences, in normal weather conditions, to determine the amount of chemicals released into the atmosphere. <Costa, OCE. 4/17/03>

Refinery and District safety requirements preclude sampling in the flare combustion zone. Remote sensing can be used to study combustion emissions. The District is following such a study being conducted under contract to the Texas Commission on Environmental Quality (TCEQ).

61. The flare monitoring rule should require that the BAAQMD include all the emissions reported pursuant to the proposed rule in the emissions inventory to assess whether the Bay Area is making Reasonable Further Progress in the direction of compliance with NAAQS <Costa, OCE. 4/17/03>

The BAAQMD emissions inventory already includes flare emissions of 13 tons per day based on data from an earlier BAAQMD flare study (see the discussion regarding inventory issues in the Bay Area 2001 Ozone Attainment Plan on pp. 6-7). Although the District's preliminary estimate in the current flare study was higher than 13 tons, the estimate was based in part on assumptions that will need to be revised to reflect data received after the estimate was made. Although the current study has not been finalized, emissions estimates will likely be lower than indicated in the draft study, and may be no higher for the study period than the 13 tons already included in the inventory. Data gathered through monitoring installed pursuant to the monitoring rule should provide a basis for estimating flare emissions that is far superior to the bases underlying previous estimates, and can be used to refine the inventory.

62. The 98-99% destruction efficiency rate assumes that certain meteorological conditions are also being met. EPA studies conducted in the early 1980's do not take into account environmental factors that may affect flare efficiency. "There is no suggestion [in the EPA study] that combustion efficiencies may depend on parameters that influence flame size, and consequently heat releases, such as stack velocities and wind speeds." [Douglas M. Leahey, Katherine Preston and Mel Strosher, Theoretical and Observational Assessment of Flare Efficiency, 51 J. Air & Waste Mgmt. 1610, 1616 (2001).] More studies should be done to determine the correct destruction efficiency rate. <Costa, OCE. 4/17/03>

Most arguments about flare efficiency that have been made to the District are based on a selective reading of technical scientific and technical literature on the subject, and much of that literature is not analytically robust. The Technical Committee of the BAAQMD Advisory Council is currently exploring the question

of efficiency. In addition, an interesting flare efficiency study is currently being conducted by the Texas Commission on Environmental Quality (TCEQ). The study is expected to be completed in 2003, and the District will follow this effort and other relevant studies closely. The District agrees that a better understanding of flare efficiency is desirable, and expects that studies currently underway will promote a better understanding.

63. Bay Area residents deserve to know about the pollution released in their own backyard; the BAAQMD should publish the flare monitoring reports online. <Costa, OCE. 4/17/03>

See response #10.

64. The flare monitoring rule should ensure that the monitoring data will disclose the amount of pollution that is actually released and ensure that the information is transparent so that Bay Area residents can interpret the data. <Costa, OCE. 4/17/03>

This is the intent of the flare monitoring rule.

65. BAAQMD should conduct further investigations to ensure that flare technology is satisfactorily destroying pollutants emitted through waste streams at these facilities in the Bay Area and to take an active role in requiring facilities to reduce the level of emissions produced through upsets, startup, shutdown, and maintenance events. <Costa, OCE. 4/17/03>

The District is following the TCEQ study on flare efficiency and other studies on flare efficiency. The flare monitoring rule requires monitoring but does not impose controls. See responses #13, #17, and #21.

66. Reports of smoke are entirely dependent on visual observations made by workers at these facilities who may miss many events. BAAQMD must require accurate reporting of emission discharges from flare operating systems and improved reporting requirements so as to better distinguish between reporting of smoking flare events and opacity events which are not related to flares. <Costa, OCE. 4/17/03>

Enforcement of smoking and opacity restrictions requires visual observation, and reporting is insufficient for enforcement purposes. Opacity monitoring required by 40 CFR §60.18 is based on Method 22, a visual observation method. The District uses visual observation methods to enforce a three-minute-per-hour smoke limit on all flares, whether they are subject to the NSPS or not.

67. Reports of VOCs, H2S, and other emissions should be based on much more accurate estimates of flare performance that take into account factors which diminish combustion efficiency. <Costa, OCE. 4/17/03>

See response #62.

68. Sources are required under state and federal law to ensure that flares will not smoke for more than five minutes in a consecutive two hour period. Yet, many sources report repeated violations of flares which smoke beyond five minutes in their upset reports. BAAQMD must enforce violations of the smoking flare requirements and ensure that sources are abiding by state and federal law. <Costa, OCE. 4/17/03>

This statement is a direct quotation from a report by a New York environmental group on smoking flares in Port Arthur, Texas. It is not correct as a statement of California conditions or law. The BAAQMD enforces California and BAAQMD requirements that are more stringent than the cited standards.

69. Recent studies indicate that flare combustion technology is not performing at expected levels of efficiency when conditions such as high wind speed are present. BAAQMD must require companies to improve current technology and enhance flare design to rectify the affects of meteorological conditions on flare combustion. <Costa, OCE. 4/17/03>

This is also a direct quote from the Port Arthur, Texas report. See response #68. Regarding efficiency, see response #62.

70. Notes need to be taken at ALL meetings- whether they are community meetings, public workshops, public hearings or work group meetings. <Cosentino, Communities for a Better Environment (CBE). E-mail. 4/17/03>

The District generally makes sound recordings of workshops but did not do so for the community meetings on the flare monitoring rule. It is important to note that the meetings were conducted in addition to, not in lieu of, an opportunity to submit comment.

71. Notes from community and industry meetings need to be posted on the District's website and distributed to all participants. Transparency in the rule making process is of benefit to everyone involved. <Cosentino, CBE. 4/17/03>

The District regularly meets with community members and with the industries it regulates. Many of these meetings are informal, and notes are not taken. District resources available to record these informal discussions are limited. At some point, commitment of resources to transcription of discussions takes away from the District's ability to conduct outreach and solicit views.

72. Facilitation needs to be improved. The District should have both a facilitator and a "stacker" (to keep track of who raises their hand first and call on people) at all meetings. Also the stacker should help bring around a

microphone which would ensure everyone can hear the public's questions and comments as well as the Districts (the microphone would also record people's comments). Everyone should be allowed to speak, and open discussion about issues should be encouraged. <Cosentino, CBE. 4/17/03>

Comment noted. These appear to be reasonable suggestions for conducting some formal meetings.

73. Develop a follow up plan with the community. The District does not need to answer everyone's questions in the meeting, but should develop a follow-up plan with the community as to how issues will be addressed by the District. <Cosentino, CBE. 4/17/03>

Comment noted. This also appears to be reasonable for certain processes.

74. An agenda needs to be provided ahead of time and should be posted and followed in the meeting. I understand the District intended to move quickly to adopt a flare monitoring rule. However, this should not be at the expense of a meaningful public process. I remind you that a false process such as this violates Environmental Justice Principles. Environmental Justice Principle #7 Environmental Justice demands the right to participate as equal partners at every level of decision-making, including needs assessment, planning, implementation, enforcement and evaluation. <Cosentino, CBE. 4/17/03>

The District disagrees with the view that the process for developing this proposed rule was somehow a "false process." The meetings that were conducted provided a forum for discussion of a great many issues and concerns, and many members of the communities thanked us for the effort. We have also provided extensive opportunity for comment since the meetings. The District acknowledges that more productive feedback and discussion could have occurred if there were more time to complete the process. As you know, the 2001 Ozone Plan as approved by the three regional agencies allowed to the end of 2003 to complete the further study measures. At the request of CBE and others, the District agreed to complete drafts of the further studies by the end of 2002. This has left us with fewer resources to devote to the control measures in the Plan.

75. I believe it would be of great benefit to the District in administering this rule, if the requirement was added for submittal of a Flare Monitoring Plan from each affected refinery. The required plan would include:
Description of all flare monitoring and video monitoring equipment proposed for compliance with the rule;
Detailed description of manufacturer's specifications, including type, manufacturer, model, range, precision, accuracy, calibration and maintenance requirements, and recommended quality assurance

procedures;
Description of proposed sampling locations for each flare at the facility;
Description of proposed type of gas composition sampling and analytical methods to be used for each flare at the facility;
Description of selected flow verification test methods to be used;
Description of data collection and management systems;
Proposal for alternative sampling methods/protocols.
I think that adding this level of structure to the new rule would benefit both the refineries and the District in overall execution of the new rule, especially considering individual system modifications over time. Wileen Sweet-Dodge, Environmental Manager, Emerald Hills, CA. E-mail. 4/17/03.

The District considered this approach. The South Coast AQMD rule requires submission of monitoring plans that include these elements. However, incorporating a process for plan submission, review, and approval would substantially delay effectiveness of the rule. District staff ultimately decided that requirements for flare monitoring could be adequately put into effect and enforced through generic rule provisions. The District believes the proposed rule, in conjunction with other information-gathering tools, will allow it to obtain necessary facility-specific information, and to track changes that occur over time.

76. Once a day gas composition sampling allowed by the rule completely invalidates its usefulness, and legally allows 11 or more tons per day of unmonitored hydrocarbon emissions, resulting in little or no progress toward monitoring and determining Bay Area flare emissions. <May, Communities for a Better Environment (CBE). E-mail. 4/17/03>

This comment was based on the sampling trigger proposed in an earlier draft. The trigger level has since been modified and made more stringent relative to that earlier draft. Even with the trigger level in the earlier draft, all flows would be monitored for volume, and so it was not the case that 11 tons of emissions would go unmonitored. See response #1.

77. Sampling should be required every 15 minutes rather than once per day. <May, CBE. 4/17/03>

The current proposal allows four different approaches to sampling. Three of the four methods require sampling every 15 minutes or continuously. Manual sampling, which is also allowed, is likely to be used for flares that are used infrequently. Manual sampling would not be practical for flares used regularly because it would become cumbersome with regular use and would involve unnecessary risks to workers. Even this manual sampling method is more stringent than the South Coast AQMD rule.

78. Readily available and cheap autosampling should be required to protect workers from hazards and to facilitate more frequent sampling. <May, CBE. 4/17/03>

Autosampling is one of the methods allowed in the rule. The rule continues to allow manual sampling because some flares have not been used in years, and imposing a requirement to install auto-samplers or continuous analyzers for these flares would not be reasonable. See response #77. All equipment, whether manual sampling equipment, auto samplers, or continuous analyzers require attention and maintenance and therefore some risk to workers.

79. Available flow monitoring equipment has the capability to detect flows ten times lower than the 50,000 cu ft/hour threshold, making unnecessary the exemptions for lower flows where efficiency may be lower. <May, CBE. 4/17/03>

No version of the rule has included such an exemption. See response #2.

80. The lax "flow verification" section (12-11-602) allows the choice between vague and undefined methods for quality control of flow measuring equipment and should be narrowed and defined. <May, CBE. 4/17/03>

Section 12-11-602 has been revised to delete less well defined verification methods. Also see response #3.

81. The flare efficiency is defined as 98% in the regulation, which does not account for conditions known to cause efficiency to go far below this number. <May, CBE. 4/17/03>

Most arguments about flare efficiency that have been made to the District are based on selective readings of scientific and technical literature, and much of that literature is not analytically robust. The District expects that progress will be made in the near future towards understanding flare efficiency. For instance, the Technical Committee of the BAAQMD Advisory Council is currently exploring the question of efficiency. In addition, an interesting flare efficiency study is currently being conducted by the Texas Commission on Environmental Quality (TCEQ). The study is expected to be completed in 2003.

The proposed rule did not require calculation of emissions by flare operators, and the specification in earlier drafts of the efficiency to be used was deleted. At the request of WSPA and the Unions at the May 8th flare workgroup meeting, the revised rule re-incorporates a requirement for emission calculations. The Unions suggested using the efficiencies specified in the Texas rule (98% for most flares, 93% for low-BTU gases). While WSPA has argued for higher efficiency, the proposed rule includes the Unions' suggestion.

The reasoning behind specifying an efficiency figure, as articulated by the Unions and WSPA, seems to be that it is better to provide the public with some estimate of total emissions, even if the estimate employs some assumptions that are open to debate. District staff was persuaded by this reasoning, and so has incorporated assumed efficiencies in the revised rule. However, it is important to

note that these efficiencies are set for the narrow purpose of emissions estimates to be made in reports submitted by refineries pursuant to the rule. The proposed rule does not restrict the District or anyone else from using a different efficiency figure in any other context. If the District does use a different efficiency figure, it will of course explain its reasoning for doing so. If more reliable information regarding flare efficiency becomes available, the District will consider revising the rule to reflect that information.

82. The District should explore and report on available methods for determining flare efficiency and emissions in the atmosphere. <May, CBE. 4/17/03>

The Advisory Council Technical Committee is examining the question of flare efficiency. The District is also monitoring progress on the TCEQ study mentioned in response #62.

83. Putting video monitoring of flaring on the web would allow District staff to instantly view in real-time the same incidents neighbors are reporting, and allow them to discuss flaring with refinery personnel as events are occurring. <May, CBE. 4/17/03>

The proposed rule does not require web posting for the reasons discussed in the staff report (see discussion of Section 12-11-507). Video monitoring records must be submitted to the District each month.

84. Video monitoring records should also be electronically stored at the District. <May, CBE. 4/17/03>

See response #82.

85. The current version of the rule actually neglects to require that the refiners submit the video image archives to the District with the monthly report. <May, CBE. 4/17/03>

Section 12-11-401 has been revised to require submission to the District.

86. The rule unnecessarily limits the requirement for storage of video monitoring to one frame per second, effectively reducing the video monitoring to a bunch of snapshots that don't show the full effect of flame characteristics. <May, CBE. 4/17/03>

The video frame rate of the proposal is intended to ensure that electronic video files are of reasonable size so that they can be easily stored and distributed. This requires a frame rate of one frame per minute, the frame rate found in the proposed rule. At higher frame rates, files cannot be sent electronically and would require multiple DVDs per month to store the images for each flare.

87. The recently added blanket exemptions for monitoring sulfur recovery plants and flexicoker gas ignore hydrocarbons present in these streams which can significantly add to flare emissions. <May, CBE. 4/17/03>

The exemption in the earlier draft rule was not a "blanket exemption;" the exemption only exempted these flares from composition monitoring for hydrocarbons. Monitoring for flow and sulfur content was required. The proposed rule entirely deleted this exemption. District staff is now recommending in the revised rule to add back a more limited exemption for flares burning gas from a flexicoker. For these flares, the operator would have to monitor for flow and sulfur content. The limited exemption would allow an operator to avoid monitoring for hydrocarbons provided methane concentration was demonstrated to be less than 2% and non-methane hydrocarbon content was demonstrated to be less than 1%.

88. Exemptions for monitoring flaring of operations of wastewater ponds, marine vessels, and storage tanks could represent huge emissions and should be removed. <May, CBE. 4/17/03>

These exemptions are limited to thermal oxidizers for which emissions can be measured directly and to several small flares that serve as backup to vapor recovery systems. The one flare that is neither a thermal oxidizer nor a safety backup flare is one that controls emissions from a railcar loading operation at the Shell refinery. The staff report now includes a more detailed discussion of the exemptions and the sources to which they would apply.

89. Equipment downtime less than 24 hours is exempt from reporting. <May, CBE. 4/17/03>

The proposed Section 12-11-401.7 requires reporting of downtime exceeding 24 hours. District staff are recommending in the revised rule to require that monthly reports include all downtime. This data for shorter downtime periods would generally be available in the monthly reports even without this explicit requirement because monitoring data from flow meters and continuous analyzers should be continuous data; all monitor downtime would then appear as data gaps. For CEMs, the refineries typically note data gaps due to meter downtime. Note that the rule requires calculation of flows if flow monitors are down, and sampling if continuous analyzers are down.

90. Both H2S and total sulfur need to be monitored (not total reduced sulfur which misses oxidized sulfur compounds-section 502.3 3.2). If only total sulfur is measured, then for purposes of compliance with federal Subpart J H2S limits, all of total sulfur must be considered as H2S. <May, CBE. 4/17/03>

Flare gas does not contain significant amounts of oxidized sulfur compounds. Monitoring of total reduced sulfur is appropriate for determining compliance with

the Subpart J limits, which apply to flares that were subject to New Source Review and are used as control devices.

91. Continuous monitoring is feasible, and monitoring "dirty" streams of fuel gas and sulfur recovery plants is common in Bay Area refineries. <May, CBE. 4/17/03>

Continuous analyzers are used at refineries to monitor sulfur compounds in fuel gas and after sulfur recovery. Fuel gas is quite clean compared to flare gas, and any monitoring at sulfur recovery plants using sensitive equipment is downstream of sulfur recovery and required tail gas control units. No refinery in California or Texas has used continuous analyzers on flare vent gas. The rule is structured to encourage this approach, but other methods must be allowed to ensure that the rule will be workable.

92. The public review process for this rulemaking had severe problems which can be avoided in the future. <May, CBE. 4/17/03>

At the direction of the APCO/Executive Officer, the staff put the development of this rule on a fast track. As the commenter is aware, the 2001 Ozone Plan as approved by the three regional agencies allowed to the end of 2003 to put into effect control measures anticipated in the Plan. At the request of CBE and others, the District agreed to complete drafts by the end of 2002. It was foreseeable and perhaps inevitable that we would have to expedite this rulemaking effort and that other control measures will be similarly expedited. The District has tried to balance the need for an expedited process, as driven by Plan deadlines, with the desire expressed by many for a more thorough and deliberate rule development process.

93. The rule proposed by the District would fail to detect up to 93% of flaring events, based on actual flaring data submitted by the Shell refinery, and would fail to detect up to 80% of flaring events at the ChevronTexaco refinery. Because of inadequate detection limits, the proposed rule would allow the flares to release over 28 million cubic feet per day of gases, or a total of 11 tons per day, without any monitoring. <Drury and Fox, Refinery Trade Unions - PSU Local 302, IBEW Local 549, Laborers Local 324, Insulators Local 16 (Unions). E-mail and messenger. 4/17/03>

None of this flow would be missed by flow meters. The comment is misleading in failing to state that the commenters are claiming that <u>composition</u> sampling would not be required for these flows because, in their opinion, the sampling trigger in the earlier draft was not sufficiently stringent (note that the revised rule includes the trigger level advocated by the Unions in their comments). The Shell and Chevron data is not "actual flaring data" and does not come from flow meters. It is based on calculations and estimates and therefore on average flows. Because averages would miss the variability that is found in actual flow meter measurements, the Shell and Chevron estimates provide no information that can

be used to determine whether sampling would have been required under any proposed trigger. It can be said, however, that most of the Shell flaring events were of such short duration that no sampling would have been possible, regardless of the sampling trigger used. It is also important to note that the Shell and Chevron estimates indicate that these two refineries were together responsible for about 9% of all vent gas flared during the study period (excluding Shell's flexi-gas flare for which sampling or continuous analysis would clearly be required under either the earlier or current trigger proposal).

94. The proposed rule is inadequate because it only requires once per day monitoring for most flaring events (Rule Section 502.3.3. I.a) except when the flow to the flares exceeds 50,000 cubic feet in any 60 minute period. The Bay Area's rule should be at least as stringent as the rules in Texas, Utah and Los Angeles. The rule should require automatic sampling or continuous composition monitoring every 15 minutes after any flow is detected above 0. 1 feet per second, and the sampling should continue every 15 minutes until the flaring ceases. <Drury and Fox, Unions. 4/17/03>

The composition monitoring trigger level in the revised rule is identical to that in the South Coast AQMD flare monitoring rule. However, the sampling frequency requirement is far more stringent than the South Coast rule because it requires samples every 15 minutes after the trigger level is reached if integrated sampling is used and every 3 hours if manual sampling is used. Note that manual sampling is not likely to be used if a flare is in regular use. See response #77. The South Coast rule only requires one sample per week once sampling is triggered.

The Texas rule applies to flares that receive gas streams containing at least 5% highly-reactive VOCs (defined as 1,3 butadiene, butenes, ethylene, and propylene – see Title 30, Texas Administrative Code §115.10). Refinery flare gas typically contains less than 5% of these highly-reactive VOCs. The Texas rule was written for chemical plant flares and is not an appropriate comparator.

The Utah rule applies to landfill gas collection systems and requires that <u>flow rate</u> (not composition) be monitored every 15 minutes "to identify periods when the gas flow has been diverted from the control device or periods of no flow from the collection system." The Utah rule therefore does not support the commenter's assertion regarding frequency of composition monitoring. Regarding flow rate monitoring, the Utah rule is clearly less stringent than the proposed rule, which requires continuous monitoring of flow rate.

95. The detection limits required by the rule will fall to detect many flaring events, despite the fact that much more accurate technology is readily available. <Drury and Fox, Unions. 4/17/03>

The rule requires all flows to be measured and reported (see Section 12-11-401). The comment is based on a misinterpretation of Section 12-11-501, which specifies a series of requirements for any device used to measure flow. These requirements can, at present, be met only by ultrasonic flow meters. A major manufacturer guarantees these meters to be accurate to within 5% over the range from 1 to 275 feet per second. Specifying this flow velocity range does not mean that the meter does not measure lower flows; it just does so with reduced accuracy.

96. The proposed rule only requires monitoring of what goes into the flare, not what comes out and assumes that 98% of flare gas is destroyed. An estimated efficiency of 98% should only be allowed when the requirements of 40 CFR §60.18 are met. At all other times, an estimated efficiency of 80% should be used, which is the lowest reported efficiency in studies relied upon by the District for a large flare. The BAAQMD should conduct a flare destruction efficiency study to analyze actual efficiency in the field, and the results of that study may be used to refine the rule. <Drury and Fox, Unions. 4/17/03>

See response #81.

97. The exemptions for marine vessel loading, sulfur recovery plant flares, flexicoker flares, thermal oxidizers, and organic liquid storage should be removed from the rule. <Drury and Fox, Unions. 4/17/03>

The exemption for sulfur recovery plants and flexicoker flares was removed from the proposed rule. Staff is now recommending and has included in the revised rule a limited exemption for flexicoker flares. The staff report provides justifications for the other exemptions included in the rule. All of the exempted devices, except for flares exempted by Section 12-11-110, are thermal oxidizers, which, unlike flares, are enclosed combustion devices that exhaust combustion products through a duct or stack where they can be directly measured. The proposed rule requires monitoring of the gas input to flares because there is no readily-available means to directly measure flare emissions (though some remote sensing devices are being used in research). There is no useful purpose in imposing flare monitoring requirements on devices from which emissions can be directly measured. For a discussion of the flares exempted by Section 12-11-110, see response #99.

98. The staff report provides no justification for the distinction between flares and thermal oxidizers or the assumed de minimus [*sic*] emissions. <Drury and Fox, Unions. 4/17/03>

This comment was made on an earlier draft of the staff report. The staff report discussion of this issue has been expanded. As noted in response #92, thermal oxidizers and flares are different devices. The thermal oxidizer definition in the proposed rule (Section 12-11-209) clarifies this distinction. The Fox comments

are incorrect in claiming that "a thermal oxidizer is a flare." The distinction drawn between the two in most air pollution control literature is the same as that drawn by the added language: a thermal oxidizer exhausts combustion products through a duct or stack where emissions can be directly measured. For that reason, it would serve no useful purpose to impose requirements to monitor gas going to a thermal oxidizer when the combustion products can be directly measured in the stack.

99. The exemption for organic liquid storage and distribution [in Section 12-11-110] is not justified because emissions are high enough to warrant concern. <Drury and Fox, Unions. 4/17/03>

The staff report states that this exemption would apply to six sources in the District: a backup safety flare for a propane tank at the Tesoro refinery, a similar flare for a butane sphere at the Valero refinery, three backup flares for vapor recovery systems on tanks at the Shell refinery, and a flare for the LPG railcar loading operation at the Shell refinery. All but the LPG loading flare are secondary control devices that are used when a vapor recovery system fails or is being maintained. The Fox comments claim that "the emissions from the Shell tank flares were 1.2 tons per year of VOCs and 0.1 ton/yr of SO2" as the basis for an argument that the flares should not be exempt from the rule. The VOC emissions are 6.6 pounds per day. From the perspective of the proposed rule, these emissions are de minimis and do not warrant the kind of monitoring that the rule requires for flares, which can potentially emit VOCs at a rate three or four orders of magnitude higher. In addition, all of these sources are control devices used to comply with other District regulations.

100. The exemption for flares and thermal oxidizers used to control marine vessel loading should be eliminated because there is no data to confirm that they have negligible emissions. <Drury and Fox, Unions. 4/17/03>

Thermal oxidizers are used at the Chevron, ConocoPhillips, and Shell refineries to meet Regulation 8, Rule 44 control requirements. No marine loading terminal uses a flare for control. The thermal oxidizers at the three marine terminals have high efficiencies that are mandated by the rule and by permit conditions and can be directly verified by source tests. Because these devices are, by definition, thermal oxidizers, they are not subject to the rule. This exemption is therefore included merely to clarify their exempt status. In any case, it would serve no useful purpose to impose the flare monitoring rule requirements on these devices because emissions can be directly determined through a source test of the thermal oxidizer stack.

101. The exemption for thermal oxidizers used to control emissions from wastewater treatment systems should be eliminated because emissions from wastewater systems are significant. <Drury and Fox, Unions. 4/17/03>

The Fox comment suggests that because wastewater treatment systems as a category may have significant emissions, thermal oxidizers that control wastewater sources should be subject to the flare monitoring rule. But emissions from thermal oxidizers are directly verifiable; imposing requirements to monitor gas flow to an oxidizer would be unnecessary. In any case, these devices are exempt by definition. See responses #98 and #100.

102. Sulfur recovery plant flares should not be exempt because of the potential for organic emissions. <Drury and Fox, Unions. 4/17/03>

This exemption has been dropped.

103. Flexicoker flares should not be exempt from monitoring for hydrocarbon and methane composition because flexicoker gases may contain elevated concentrations of methane and other hydrocarbons. <Drury and Fox, Unions. 4/17/03>

This exemption was dropped from the proposed rule. Staff are recommending and have included in the revised rule a limited exemption from hydrocarbon and methane monitoring (Section 12-11-114). The exemption is conditioned upon a weekly lab analysis showing that methane and non-methane hydrocarbons are not found in elevated concentrations (methane content must be less than 2% and non-methane hydrocarbon content must be less than 1%).

104. The definitions of flare and thermal oxidizer are inadequate. <Drury and Fox, Unions. 4/17/03>

These definitions have been clarified. Language in the definition of thermal oxidizer makes it clear that a thermal oxidizer exhausts combustion products through a vent, duct, or stack that allows direct measurement of combustion products. See response #98.

105. The vent gas definitions should not exclude purge and pilot gases because only vent gas is monitored for composition, and these gases may contain hydrocarbons. <Drury and Fox, Unions. 4/17/03>

Most of the flares at refineries in the District use water seals and do not use purge gas at all. For those that do, natural gas is used. Requiring composition monitoring would be pointless. If there were a reason to require this monitoring, changing the definition of vent gas would not be the appropriate way to accomplish this purpose.

106. The rule should be modified to require posting of monthly reports on the District website within 24 hours, placing copies in libraries, and preparation and distribution of CDs containing all supporting data. <Drury and Fox, Unions. 4/17/03>

The District will consider use of the District website. See response #10.

107. The reporting requirements allow emission calculations to assume a flare control efficiency of 98%. The studies do not support this assumption, and we recommend that the section be amended to adopt the TNRCC approach. <Drury and Fox, Unions. 4/17/03>

See response #81.

108. The language in Section 12-11-501.2 should be modified to read: "The device shall continuously measure velocity over the full potential range of operation of each covered flare, from a minimum velocity of 0.1 ft/sec to the maximum expected for each individual flare, but no lower than 275 ft/ sec. <Drury and Fox, Unions. 4/17/03>

This comment reflects a concern that the specification (in Section 12-11-501.2) that the flow measurement device measures the velocity range from 0.5 to 275 feet per second is a limitation on the requirement in Section 12-11-401 to report all flows. Section 12-11-501 is intended as a device specification that effectively dictates ultrasonic meters. The velocity specification does not mean that the meter is incapable of measuring lower flows; it just does so with reduced accuracy.

109. We recommend that the rule be revised to require a minimum accuracy of 5% over the entire flow range. <Drury and Fox, Unions. 4/17/03>

The proposed rule did not include an accuracy specification for the flow monitoring device. The revised rule now includes an accuracy specification in Section 12-11-501.

110. Section 501.4 should be modified to require that the monitor be located 'on the main flare header, after the knock-out pot and addition of any supplementary fuel' to assure that it measures the flow that is actually combusted. <Drury and Fox, Unions. 4/17/03>

The suggested language is too prescriptive and, in some cases, would dictate the installation of a flow meter within the radiation zone of a flare. The heat would destroy the meter.

111. We recommend that Section 501.3 be modified to require molecular weight, temperature, and pressure to be continuously measured. <Drury and Fox, Unions. 4/17/03>

Time of flight ultrasonic meters automatically make these measurements in order to produce volumetric flow outputs in standard cubic feet. Including these requirements in the device specification would preclude competing technologies that might offer superior performance without relying on these measurements. The proposed rule adds a requirement that molecular weight data be reported if available from the flow meter (Section 12-11-401).

112. We recommend that Section 501.3 be modified to require that the monitors be maintained according to vendor specifications and annually calibrated to specifications. <Drury and Fox, Unions. 4/17/03>

All drafts of the rule have included a requirement (in Section 12-11-506.3) that meters be maintained and calibrated in accordance with the manufacturer's specifications.

113. Because of worker safety issues, we suggest that the rule state that manual sampling may be not be used. <Drury and Fox, Unions. 4/17/03>

The proposed rule does not include a provision for manual sampling. However, District staff have concluded that manual sampling is an appropriate option for flares that are used infrequently. For these flares, which may combust vent gas less than once per year, installation of auto-samplers or continuous analyzers would be unreasonable. In addition, the maintenance necessary to keep this equipment in a state of readiness would involve greater worker exposure to risk than would an occasional need to sample manually. The revised rule therefore includes a manual sampling option. This option uses the stringent South Coast AQMD trigger for sampling.

This manual sampling option would probably not be practical for flares that are used with some regularity. The need to continually take samples would be burdensome, and would likely result in missed samples. Because of these considerations, the District expects that the use of manual sampling will be restricted to low usage flares.

114. The draft rule's trigger of 50,000 standard cubic feet in an hour with samples required within 15 minutes for auto-samplers and 30 minutes for manual sampling and with subsequent samples every three hours thereafter means that samples are taken at flows that are too high, too long after flaring starts, and too infrequently thereafter. The rule should be modified to require that sampling commence within 15 minutes of the detection of flow and to reduce the sampling frequency to every 15 minutes. <Drury and Fox, Unions. 4/17/03>

At the flare workgroup meeting on April 18th, significant time was spent discussing the trigger level for composition sampling. Based on these discussions, the proposed rule specified a composition sampling trigger level of 6,000 standard cubic feet in 15 minutes, which represented a flow velocity of approximately 0.5 feet per second, the lowest velocity that District staff felt would represent real flows to the flare (see response #1). At the May 8th workgroup meeting, refinery representatives suggested that the trigger was too sensitive, and the Unions proposed use of the South Coast AQMD trigger. The revised rule incorporates the South Coast sampling trigger, with sampling to begin within 15 minutes. Sampling would then be required every 3 hours with the manual sampling option, every 15 minutes with integrated sampling, and continuously

with continuous analyzers. These requirements for sampling frequency are far more stringent than the South Coast AQMD requirements (which specify one sample after the trigger is reached and a weekly sample thereafter).

115. Section 12-1-502 should be revised to require that both total sulfur and H_2S be measured because oxidized sulfur compounds are included in vent gas streams. <Drury and Fox, Unions. 4/17/03>

Oxidized sulfur would not typically be found in flare vent gas in significant quantities.

116. Section 502 should be modified to require that opacity and net heat content be monitored using the methods in 40 CFR 60.18 to ensure that the control efficiency is met. <Drury and Fox, Unions. 4/17/03>

Opacity monitoring required by 40 CFR §60.18 is based on Method 22, a visual observation method. The District already uses visual observation methods to enforce a three-minute-per-hour limit on all flares, whether they are subject to the NSPS or not. The District standard is more stringent than the NSPS standard. Sampling, integrated sampling, and GC analysis already specified in the rule would provide composition data that would allow the heat content to be calculated.

117. We recommend that Regulation 12, Rule 11 be expanded to require that each refinery use an optical, remote-sensing instrument capable of measuring both S02 and hydrocarbons in flare exhaust gases. <Drury and Fox, Unions. 4/17/03>

Optical remote sensing equipment is currently used in flare efficiency research. This equipment is large, complicated, extremely costly, and requires highly-trained operators. Open-path passive FTIR systems rely on radiation differences between hot flare combustion gases and background and have higher limits of detection than active FTIR systems which use a radiation source. FTIR measurements depend upon keeping the plume within the instrument's field of detection. Passive FTIR is not suitable for flare monitoring because the flare plume varies in size and shape with flaring rate and moves with wind. Flare studies require skilled operators to ensure that the plume remains within the instrument's window.

118. We recommend that Section 506.1 be modified to require recordkeeping of all periods of monitor inoperation and monthly reporting of the accumulated downtime for each monitor. <Drury and Fox, Unions. 4/17/03>

District staff are recommending in Section 12-11-401.7 of the revised rule that all periods of monitor inoperation be reported.

119. We recommend that Section 506.2 be modified to require that any facility electing to use a continuous analyzer must also obtain equipment to allow manual or auto-sampling when the continuous analyzer is down and use it to collect a minimum of one sample every three hours. <Drury and Fox, Unions. 4/17/03>

In the revised rule, the sampling interval for manual sampling is three hours (see Section 12-11-502.3. When a continuous analyzer is down, this would be the default sampling interval.

120. A new section should be added to Section 506 that requires that flow rate be estimated when the flow meter is out of service using either the methods in Section 602 and/or flame length as recorded by the video. <Drury and Fox, Unions. 4/17/03>

This section in the revised rule now requires that flow be estimated using good engineering practices, which would allow use of the methods in Section 602, a flame length method, or other methods as available.

121. We recommend that Section 506.3 be modified to require annual maintenance and field zeroing of ultrasonic velocity meters. <Drury and Fox, Unions. 4/17/03>

All drafts of the rule have included a requirement (in Section 12-11-506.3) that meters be maintained and calibrated in accordance with the manufacturer's specifications.

Written Comments Received in Connection with May 21st Hearing

The public hearing notice for the May 21st hearing on the revised rule indicated that comments would be accepted during the period from April 21st to May 12th. No comments were received during that period, but the following comments were received just prior to the May 21st hearing.

122. Section 401.7 waives reporting requirements during monitoring system breakdowns less than 24 hours. BAAQMD should consider revising this section to assure that the 24-hour reporting exemption due to monitoring system breakdowns is reduced or eliminated. <EPA. E-mail. 5/20/03>

EPA examined the proposed rule. The revised rule requires reporting of all monitor downtime.

123. Section 506 waives monitoring requirements during breakdown conditions. BAAQMD should consider revising this section consistent with more stringent requirements in South Coast Rule 1118 and to assure that breakdown exemptions are as short as possible. <EPA. 5/20/03>

Section 12-11-506 does not waive monitoring requirements during breakdown. Unlike the South Coast rule, Section 12-11-506 would require alternative

monitoring during periods of monitor inoperation. In addition, the composition monitoring required during downtime of automated composition analyzers is more stringent than any composition monitoring required by the South Coast rule.

124. ASTM Method UOP 539-97, referenced in Section 601, has not been reviewed by EPA for use in SIP-approved rules. BAAQMD should submit this method for EPA review. <EPA. 5/20/03>

The proposed rule specifies ASTM Method UOP 539-97 as one of three methods that may be used for the required analysis of vent gas samples. UOP 539-97 is the only ASTM method developed specifically for the analysis of the composition of refinery fuel gas, which may include up to 25% hydrogen sulfide. The proposed rule is a monitoring rule only, and as such, does not include any emission limitations. ASTM Method UOP 539-97, if used, would not be used to determine compliance. Therefore the District does not believe that it must be submitted to EPA for review.

125. Section 602, Flow Verification Test Methods, provides broad discretion for establishing methods to verify vent gas flow. Since this parameter is so critical to the rule, paragraphs 602.3, 602.4 and 602.5 should be revised to provide greater specificity on the verification methods that may be used. We are also concerned that the limit of detection for the methods in paragraphs 602.1 and 602.2 (4-6 feet per second) is not sensitive enough given the requirement in paragraph 501.1(0.1 feet per second). <EPA. 5/20/03>

Section 12-11-506.3 requires ultrasonic flow meters to be maintained and calibrated in accordance with manufacturer's specifications. Properly maintained and calibrated ultrasonic flow meters are extremely accurate. No test method has been developed to test these meters in place once they have been calibrated and installed. To get a rough check on accuracy requires the use of existing less-accurate approaches such as pitot tube traverses, tracer gas methods, or other flow or process meters. The meters are more accurate than any of these alternative approaches. No other flare monitoring rule even includes provisions that attempt to make this check (see South Coast Rule 1118). The BAAQMD provision was developed to provide a means to identify large errors that might result from misinterpretation of the meter's specified range and calibration factor. The District is proposing to revisit the rule in 18 months, review the data developed from the use of various alternatives, and make any appropriate changes in these provisions.

126. Section 502.3.1: The last sentence in Section 502.3.1.a states "In no case shall a sample be required more frequently than once every 3 hours." We do not believe it is appropriate to relieve a facility from the requirement to initiate sampling within 15 minutes of exceeding the flow rate threshold specified if one "threshold event" is followed by another within two hours of the final sample taken during the initial event. It is unclear why this

change was made or how it would be implemented. We recommend the following modification: "In no case shall a sample be required more frequently than once every 3 hours during periods of flaring that continuously exceed the sampling threshold." <ARB. E-mail. 5/20/02>

The District proposal is far more stringent than South Coast sampling provisions (which require one sample near the beginning of a flaring event and once per day thereafter during the event). The District provisions are intended to ensure that sampling is not required more frequently than is reasonably necessary for adequate data while ensuring feasibility and personnel safety. The District believes the proposed sampling requirements will provide the data necessary to adequately characterize the flare activity.

127. Section 506.1: We do not believe it appropriate to provide for "periods of inoperation" for purely manual sampling operations as proposed in Section 506.1. We recommend the following change: "Periods of inoperation of ~~the~~ vent gas auto-samplers installed pursuant to ~~composition monitoring specified in~~ Section 12-11-502.3.1 (grab sampling) shall not exceed 30 days per calendar year." <ARB. 5/20/02>

The District agrees that downtime for purely manual sampling is not appropriate. This section has been changed.

128. Section 506.1: This section states: "Effective 450 days after the adoption of this rule, periods of inoperation of the vent gas composition monitoring specified in Section 12-11-503.3.3 (continuous analyzers) shall not exceed 30 days per calendar year per analyzer." We believe the appropriate reference section is "Section 12-11-50~~3~~2.3.3". <ARB. 5/20/02>

The District agrees. This section has been changed.

129. Section 506.2: During periods of inoperation of continuous analyzers or auto-samplers installed pursuant to Section 12-11- 502.3, we believe persons responsible for monitoring should be required to take samples as specified in Section 12-11-502.2. We recommend the following changes in the sections referenced in 506.2: "During periods of inoperation of continuous analyzers or auto-samplers installed pursuant to Section 12-11-502.3, persons responsible for monitoring shall take manual samples as required by Section 12-11-502.3~~2~~.1." <ARB. 5/20/02>

The District believes the sampling provisions for downtime are adequate to provide data necessary to characterize flaring during these periods. Staff reviewed its database for existing monitors in sulfur plants and fuel gas service (a service that is most similar to flare gas service) that were reported out of service pursuant to the CEM downtime provisions. These periods were infrequent, and it is anticipated that this will be the case for flare monitoring.

130. Section 507: We believe the one frame per minute video recording specification in Section 507 should be increased such that the recorded image is more representative of a real time recording and that each facility be required to archive their captured video data on a hard drive, and make specific portions of the archived data available to the district upon request. Due to the ability of current technology to store large volumes of digital data on one large hard drive (80 gig), we believe this approach will enable capture rates in excess of one frame per minute while still providing for a reasonable archive retention time (at least two weeks, possibly one month). <ARB. 5/20/02>

The District is now proposing to refer the issue of webcasting to the Stationary Source Committee of the Board. To avoid imposing video recording and storage requirements that would require immediate decisions about technology that might prove to be inconsistent with later recommendations of the Stationary Source Committee, the District is proposing to push back the effective date of this provision to allow further study of webcasting and related issues. Section 12-11-507 has been modified to be effective 180 days after rule adoption rather than 90 days to allow the necessary time for this effort.

131. Section 602: Due to the flexibility provided in the flow verification requirements of Section 602, we recommend each facility be required to submit a proposed flow verification plan that must be approved by the district prior to its implementation. <ARB. 5/20/02>

The District considered this option in the early stages of the workgroup meetings. South Coast Rule 1118 includes plan submittal requirements for flare monitoring. (Note that the South Coast rule has no flow verification requirements like those to which this comment refers.) The District believes that including plan submittal requirements for flow verification would add unnecessary delay in implementing the flow and composition monitoring requirements of the rule. The District is proposing to revisit the rule in 18 months, review the data developed from the use of various verification methods, and propose any necessary changes to these provisions.

132. The BAAQMD should adopt the Texas Rule under which an estimated efficiency of 98% should be allowed only when the requirements of 40 CFR §60.18 are met. At all other times, an estimated efficiency of 93% should be used. <Drury, Refinery Trade Unions - PSU Local 302, IBEW Local 549, Laborers Local 324, Insulators Local 16 (Unions). E-mail. 5/20/03>

The Texas rule does not apply to refinery flares (see response #94). District staff contacted TCEQ and confirmed this point. Nevertheless, the revised rule incorporated the concept of specifying an efficiency of 98% except for low-BTU gas. In the reviseed rule, 98% was specified except for the flexicoker flare, for which 93% was the default value. This flare handles flexicoker gas that has a low heating value. Staff are now proposing a change that requires the use of

93% for <u>any</u> vent gas with a lower heating value less than 300 British Thermal Units/Standard Cubic Feet (BTU/SCF)and therefore would not meet the requirements of 40 CFR §60.18. This is a minor change because data gathered during the flare study shows that most flare gas, with the exception of flexicoker gas, exceeds this BTU threshold.

133. The BAAQMD should conduct a flare destruction efficiency study to analyze actual efficiency in the field, and the results of that study may be used to refine the rule. <Drury, Unions. 5/20/03>

See responses #81 and #96.

134. Webcasting: The rule would be greatly improved by requiring "webcasting" of flare video-monitoring. Webcasting would allow any interested member of the public, including Air District staff and Board members, to see what is happening with refinery flares in "real time" simply by clicking on a page on the BAAQMD's website. Air District staff could verify public complaints of refinery flaring instantly simply by clicking on the website. Webcasting is a low-cost and widely available technology. <Drury, Unions. 5/20/03>

To discuss webcasting and other issues, the District convened a meeting of the flare workgroup immediately following the May 21, 2003 Board meeting. Representative from WSPA, the individual refineries, refinery labor unions, and CBE attended this meeting. The consensus of all present was that the webcasting issue should be separated from the proposed rule and that the proposed rule should be adopted and implemented. District staff is recommending that the webcasting issue be referred to the Board's Stationary Source Committee.

135. As you are well aware, the rate of asthma has climbed dramatically in the past decade, and ozone has been documented to have a direct connection. Of course, we are also concerned about particulate matter in release of emissions, as well as other chemicals. We agree that the videotaped footage of flaring required by the rule be placed on the web so that BAAQMD can view the same images that the public is seeing. And we also ask that the rulemaking begin soon to control flare emissions, not simply to monitor. <Weiner, American Lung Association of San Francisco and San Mateo Counties (ALA). E-mail. 5/20/03>

Ozone exposure in the Bay Area has declined at the same times that asthma rates have increased. The weight of the evidence suggests that ozone is not responsible for increases in Bay Area asthma rates. While it is true that high ozone levels can trigger asthma attacks, high levels are uncommon in the Bay Area.

Regarding webcasting, see response #134. The District's flare workgroup is still working on the flare study that will determine the next steps regarding potential controls on flares. The District expects that if the study concludes that controls are available, the rule development effort to impose controls could be concluded by the end of 2003.